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PITTMAN (H. A.). **Virus diseases of plants. With particular reference to the spotted or bronzy wilt disease of Tomatoes.**—*Journ. Dept. Agric. Western Australia*, Ser. 2, xi, 1, pp. 123–140, 13 figs., 1934.

After a general survey of the virus disease problem in the light of current investigations [*R.A.M.*, xiii, p. 717], the writer gives an account of spotted wilt of tomatoes which is stated to be responsible for heavy annual losses in Western Australia and other parts of the Commonwealth [ibid., xi, p. 549; xiv, p. 107]. Owing to absence of insect-proof glasshouses in Western Australia, experimental evidence of the presence of the spotted wilt virus is unobtainable, but its occurrence in a severe form is symptomatically indicated on dahlias, Iceland poppies [*Papaver nudicaule*], asters [*Callistephus chinensis*], *Calliopsis* [*Coreopsis*] *drummondi*, nasturtiums [*Tropaeolum majus*], *Ranunculus*, *Anemone*, and perennial scabious [*Scabiosa* sp.], while milder injuries are sustained by *Petunia*, *Cosmos*, English marigolds [*Calendula officinalis*], and columbines [*Aquilegia vulgaris*].

On these plants the symptoms of spotted wilt do not very closely resemble those on tomato, with the result that diagnosis is not always easy. Common features of the disorder are a 'clearing' of the green colour along or adjoining the veins, a faint bronzy or brassy hue on the upper leaf surfaces, death and necrosis of petiole tissue, and the formation of dead, sunken patches on the peduncles. Iceland poppies, *Anemone*, and *Ranunculus* are either rapidly destroyed or may linger without producing any more normal flowers. Young dahlia leaves are often reduced to little more than midribs, while whitish hieroglyphs or irregularly concentric circles may appear on older foliage [ibid., xiii, p. 517]; the flower buds are blackened and seedlings may be killed off in hundreds shortly after transplanting to the flower beds. Dahlias raised from tubers are less seriously damaged than seedlings, especially in loam soils. A very marked tendency to shrivel in hot, drying winds is shown by the basal leaves of diseased dahlias, varieties of which with pale or white flowers seem to suffer more severely than red or dark-coloured ones.

In connexion with recommendations for the control of tomato spotted wilt, it is mentioned that a Balcatta variety known as Arbuckle's or Richter's is somewhat resistant, as also is Early Dwarf Red; Dwarf Champion, on the other hand, is highly susceptible.

In 1931, and again in 1933, some 35 per cent. of the tobacco plants

in an experimental plot at the Government nursery, Perth, were wiped out by spotted wilt, presumably conveyed by insects from the annual flower beds on the other side of a wire netting.

RYJKOFF (V. L.) & KARATCHEVSKY (I. K.). Вирусные бодезни Помидора в опытах по искусственному заражению. [Experiments on the artificial transmission of virus diseases of the Tomato.] —ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 7–30, 6 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

After a brief enumeration of the virus diseases of tomato which have been hitherto described in literature, the authors give a succinct account of the 'woody fruit' ('stolbur') disease of the crop [*R.A.M.*, xiv, p. 128, and next abstracts], which is stated to be extremely widespread as a cause of serious losses in the Crimea, and to have been also observed in the Ukraine, where its exact distribution has not yet been determined. The first outward symptom of the disease is a marked lightening in the normal green colour of young shoots, the leaves on which are somewhat retarded in their growth; when expanded, these leaves are very light green and more or less normal in width but considerably shorter than healthy ones, a feature which sharply distinguishes this disease from that caused in tomato by the cucurbit mosaic virus [ibid., xiii, p. 809; xiv, p. 6], in which the diseased leaves preserve their normal length but are much reduced in width. As in most other virus diseases, old stems and flower trusses fully developed before infection are not affected by the 'woody fruit' virus; trusses in course of development at the time of infection produce fruit exhibiting various abnormalities, among which woodiness of tissues and tastelessness are economically the most important. The virus was not found to be transmissible by needle inoculations, and evidence suggests that insects, possibly the leafhopper *Agallia sinuata*, are responsible for its spread in the field.

The remainder of the paper is given to a description and discussion of inoculation experiments [an account of which has already been noticed from another source: ibid., xiii, p. 808], the results of which indicated, in addition to the information previously given, that tomato mosaic and fern-leaf in the Crimea are caused by the same virus, namely, Johnson's No 1 tobacco mosaic, which is very widespread there and was also extracted from the juice of diseased chilli plants [*Capsicum annuum*]. This indicates the danger of growing tomatoes in close proximity to tobacco plantations. The experiments also supported Johnson's suggestion of the identity of true rugose mosaic with spot necrosis of the potato [ibid., viii, p. 592].

RYJKOFF (V. L.). Фильтрующийся вирус, как причина позеленения цветов. [Filterable virus as a cause of virescence of flowers.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 59–73, 9 figs., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

A detailed account is given of the teratological changes which were

observed by the author in tomato flowers naturally or experimentally infected with 'fruit woodiness' virus [see preceding and next abstracts]. These changes agree closely with those described by Samuel, Bald, and Eardley in the flowers of big bud tomato plants in Australia [*R.A.M.*, xiii, p. 62], and the Crimean disease is considered to be identical with big bud; they also agree with those described by Kostoff in the flowers of tomato shoots grafted on tobacco plants affected with the virus disease causing sterility of this host [ibid., xii, p. 599].

In the Crimea, virescence of tobacco flowers is widely and commonly observed at the same time that 'fruit woodiness' appears in neighbouring tomato plantations, and the morphological changes found in such flowers [a full description of which is given] are entirely analogous with those of virescent tomato flowers. This fact, taken in conjunction with the results of Kostoff's work, is believed to indicate the common origin of the two conditions. Closely similar conditions were also observed in the field on a number of other plants, e.g., bindweed [*Convolvulus arvensis*] (a very common weed in the local tomato and tobacco fields), belladonna [*Atropa belladonna*], *Datura* spp., and many other species of Solanaceae.

KARATCHEVSKY (I. K.). Вирусные болезни Томата в Крыму. (Год полевых наблюдений и опытов.) [Virus diseases of Tomatoes in the Crimea. (A year of field observations and experiments.)]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 39–58, 2 diags., Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

As a result of his investigations in 1932 of tomato crops in the open and under glass in several districts of the Crimea, the author established the existence there, besides the 'fruit woodiness' and tobacco mosaic (fern-leaf) virus diseases of the crop [see preceding and next abstracts], of a chlorosis characterized by a canary-yellow discoloration extending upwards from the petioles on to the leaf blades, which first appears towards the end of June, and the symptoms of which become masked on the onset of hot weather at the end of July to reappear with the return of cooler weather. The trouble was not studied more closely, although in one plantation it was abundant. Three further pathological conditions of tomatoes were also noted, namely, a yellowing of the foliage, a stunting of the leaves, and a wrinkling of the leaf surfaces accompanied by necrotic spots; while the nature of these conditions has not yet been determined, their macroscopic symptoms suggest that they are caused by viruses. All three were found only occasionally in the field.

On tomatoes in the field the tobacco mosaic (fern-leaf) disease first appeared on 18th June, ten to twelve days after transplantation of the seedlings from cold beds under glass. This indicates, since it was shown that at that season the incubation period of the disease lasts from 7 to 12 days, that infection occurred immediately on transplantation or even earlier, as tests proved that this mosaic develops at the lowest temperatures permitting growth of the host. The disease spread in the fields during the whole vegetative period, gradually slowing down as the

season advanced, but it remained confined to more or less well-defined patches, each around an infection focus, irregularly distributed in the field. The 'fruit woodiness' disease, on the other hand, appeared that year, as well as in the three preceding years, very late (about the last ten days of July) and spread at first very rapidly and regularly over the whole tomato plantations; from the second half of August onwards, however, the spread gradually slowed down and ceased, although individual new infections could sometimes be found as late as October. Not infrequently both diseases were found on the same plant, the frequency of such mixed infections being directly related with the intensity of the two diseases.

For lack of adequate information, the mosaic has been hitherto ignored by the local tomato growers, who attributed the lesions and losses caused by it to other diseases or to defective cultivation; the author, however, found it in most of the tomato-growing districts of the Crimea, with an average percentage incidence of 2·4. Special tests, the results of which were checked by statistical methods, showed that on the average the yield of mosaic tomato plants was reduced to 0·54 kg. from 1·24 kg. in the controls. Similar tests for 'fruit woodiness', which is very extensively distributed in the whole peninsula, showed that the yield in utilizable fruit of the diseased plants is reduced to about 30 per cent. of that of the controls.

A study of the weeds most commonly found in tomato fields showed that a number of them exhibited mosaic-like symptoms, but attempts to transmit the disease from them to tomatoes gave positive results only in the case of henbane [*Hyoscyamus niger*]. Among the numerous insects observed to feed on the plants, *Aphis fabae* [*A. rumicis*] and a species of *Pergandeida* alone were shown in preliminary tests to be able to transmit mosaic though they failed to transmit 'fruit woodiness', the insect vector of which was not determined.

In dealing with control measures [which are discussed in some detail] an account is given of experiments to investigate a possible correlation between the density of weeds and spread of the two diseases, the results of which showed that although dense and tall weeds apparently prevent dissemination, presumably by creating an uncongenial environment for the insect vectors [cf. *R.A.M.*, x, p. 414], careful weeding of tomato plots at frequent intervals, especially early in the season, may contribute to the control of infection.

Soukhoff (K. S.). Материалы к физико-химической характеристике ультравируса мозаики. [Contribution to the physico-chemical characterization of the filterable viruses of mosaic.]—ex *Вирусные болезни растений в Крыму и на Украине* [*Virus diseases of plants in the Crimea and the Ukraine*], pp. 31–38, Госуд. Издат. Крым [State Publ. Office for the Crimea], Simferopol, 1934. [German summary.]

The results of the experiments briefly described in this paper showed that the virus of the Crimean tomato fern-leaf disease [see preceding abstract] passes through a Chamberland filter without any noticeable loss of virulence, and that it is not inactivated, especially at temperatures between 0° and 5° C., by the addition to it of an equal volume of

acetone or 96° ethyl alcohol. These properties of the virus indicate that it belongs to the group of tobacco mosaics and is not related, as suggested by Mogendorff [*R.A.M.*, ix, p. 418] to cucumber mosaic. It was further shown that the fern-leaf virus is not destroyed by pepsin either in the crude filtrate or in the deposit formed after precipitation with acetone.

Referring briefly to the recent discovery of the widespread existence in nature of the so-called 'mitogenetic radiation' emanating from organic substances, e.g., haemolysed blood, the action of which is to accelerate budding or division in unicellular organisms (yeasts, bacteria, and the like), and of which the latter are also an abundant source [cf. ibid., viii, p. 555], the author tested for its presence the virus of tomato streak and that of tomato 'fruit woodiness', in the attempt to determine whether these viruses are living organisms or not. For this purpose agar cultures of a yeast [unnamed] were exposed for 25 minutes to the action of small masses of crushed tissues obtained from tomato plants affected with streak, 'fruit woodiness', and fern-leaf, and from tobacco plants inoculated with the tomato fern-leaf virus [no control tests with crushed tissue of healthy plants are mentioned], after which the cultures were kept for one hour in a moist chamber. Of all the tissues tested, the tomato streak tissues alone gave an indication in the first series of tests of having exerted a mitogenetic action on the yeast, while later in the season no action at all was noticed. The possibility is admitted that the mitogenetic radiation recorded in the first series may have been induced by the necrotic processes brought about by autolysis of the crushed tissues, which has been stated in literature to be a frequent source of the radiation.

ARNAUD (G.). **Le dépérissement de l'Orme (Graphium ulmi).** [The dying-off of Elms (*Graphium ulmi*).]—*Prog. Agric. et Vitic.*, cii, 36, pp. 260–265, 4 figs., 1934.

A brief popular account is given of the Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xiv, p. 63], and of its geographical distribution, as well as a short list of European and Asiatic species of *Ulmus* which have been so far reported as offering a certain degree of resistance to the disease.

GOIDÀNICH (A.) & GOIDÀNICH (G.). **Lo Scolytus sulcifrons Rey (Coleoptera-Scolytidae) nella diffusione del Pirenomicete Ceratostomella (Graphium) ulmi (Schwarz) Buis. nell'Emilia.** [*Scolytus sulcifrons* Rey (Coleoptera-Scolytidae) in the dissemination of the Pyrenomycete *Ceratostomella* (*Graphium*) *ulmi* (Schwarz) Buis. in Emilia.]—*Boll. Lab. Entomol. R. Ist. Sup. Agrario di Bologna*, vii, pp. 145–163, 5 pl., 2 figs., 1934.

A study [which is fully described] of the life-cycles of *Ceratostomella ulmi* and of the bark beetles *Scolytus sulcifrons* Rey and *S. multistriatus* (the former of which is one of the principal disseminators of the fungus in Italy) with particular reference to elm die-back in Bologna [*R.A.M.*, xii, p. 734; xiii, p. 481] demonstrated that the fungus readily fructifies in the galleries made by the insects, and that its chief means of ingress to the tree lies in the food galleries bored by them in the young branches.

The insects are also indirect agents of spread, since by making their breeding galleries in contact with diseased wood they enable the fungus to invade the gnawed débris, in which it finds conditions so favourable that it is able to form coremia, sporulation thus being much more abundant than would otherwise be the case.

As direct control by spraying with fungicides or insecticides appears to be impracticable, the authors recommend that all dead and diseased trees should be barked and also that trunks and portions of thick branches should be placed near the elms it is desired to protect to serve as bait to attract the female insects in search of places to deposit their eggs, the operation being carried out on a very large scale under proper entomological supervision. All infected material should be destroyed.

Under the conditions prevailing in Italy elm die-back usually proves rapidly fatal.

Burges (A.). **Studies in the genus Uromycladium (Uredineae). I. General introduction, the anatomy of the galls, and the cytology of the vegetative mycelium and pycnia of Uromycladium tepperianum (Sacc.) McAlp. on Acacia stricta Willd.**—*Proc. Linn. Soc. New South Wales*, lix, 3–4, pp. 212–228, 24 figs., 1934.

The author states that the Australian genus of gall-forming rusts, *Uromycladium* [*R.A.M.*, iii, p. 369], is composed, so far as is known at present, of microcyclic species. The galls [the structure of which is described in detail] formed by *U. tepperianum* on *Acacia stricta* are usually annual, but may be perennial, and are mainly composed of unlignified xylem tissue, the fungus probably utilizing the material which would normally produce lignification. The vegetative mycelium is confined to the seat of infection and is characterized by uninucleate cells. Infection usually occurs before cork formation has begun and the first tissue to react is usually the phloem, the cells of which enlarge and become meristematic in small patches. The hyperplasia deforms and ruptures the outer tissues at about the same time that the cambium and xylem become involved. Haustoria are abundant in the phloem tissues at this stage. The identity of the cambium is lost at an early stage, but the xylem rows remain evident, though unlignified, for some time. Ultimately the irregular division of the active cells caused distortion, and new tracheids may form from any of the tissues involved in the gall. The paper terminates with a full account of the cytology of the pycnidia of *U. tepperianum*.

Bittmann. **Wucherungen an der Schwarzpappel.** [Outgrowths on the Black Poplar.]—*Wiener Allgem. Forst- und Jagdzeit.*, lii, p. 50, 1933. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvii, 6, p. 146, 1934.]

Aspens [*Populus tremula*] and black and silver poplars [*P. nigra* and *P. alba*] in the Danube and other Austrian river valleys are stated to be liable to infection by *Diplodia gongrogena* Temme, which causes the development of cortical excrescences. The fungus enters the host not only through wounds but also by way of the lenticels. Canadian and Lombardy poplars [*P. canadensis* and *P. pyramidalis*] were never observed to be affected. A similar condition on willows [*Salix*] is pro-

duced by *Pestalozzia gongrogena* Temme, which causes cortical swellings that frequently girdle the branches.

BOYD (E. SOPHIA). **A developmental study of a new species of Ophiodothella.**—*Mycologia*, xxvi, 5, pp. 456–468, 1 pl., 2 figs., 1934.

Latin and English diagnoses are given of *Ophiodothella vaccinii* n.sp., a parasite of *Vaccinium arboreum* in the south-eastern United States, which has frequently been determined in herbaria as *Rhytisma vaccinii* (Sw.) Fries. The small, yellow spots on the leaves representing the initial stages of infection by the extensively branched mycelium appear about midsummer, followed towards the end of September by the development of a perfect stage, with perithecia, averaging 336 μ in diameter and 168 μ in height, in the mesophyll. On morphological grounds [which are indicated] the genus *Ophiodothella* is transferred from the family Phyllachoraceae of the Dothideales to Clypeosphaeriaceae of the Sphaeriales.

LACHMUND (H. G.). **Damage to Pinus monticola by Cronartium ribicola at Garibaldi, British Columbia.**—*Journ. Agric. Res.*, xlix, 3, pp. 239–249, 1 diag., 2 graphs, 1934.

The observations reported in this paper were started in 1922 at Garibaldi (formerly Daisy Lake), British Columbia, where blister rust (*Cronartium ribicola*) is stated to be very destructive to the western white pine (*Pinus monticola*) [*R.A.M.*, xiii, p. 814], for the purpose of following the damage done by the fungus from year to year. Of the three plots of pine studied, the first was demarcated in the midst of a dense growth of the susceptible *Ribes bracteosum* and *R. lacustre* [ibid., xiv, p. 66], the second on the border of this area, and the third was delimited in 1923 about 300 yards to the north-east, where there were only a few *Ribes* within 30 yards. In plot 1 about 40 per cent. of the trees had been killed by the rust by 1922, and 90 per cent. were dead by 1924; only one (out of 178 trees) remained alive in 1931. On plot 2, although over 90 per cent. of the trees were infected in 1922, none had been killed by that date, but about 66 per cent. had succumbed by the autumn of 1931, and it was estimated that the remainder would not survive more than a few years. On plot 3, only 40 per cent. of the trees were infected in 1923 with none dead, and the infection increased to 86 per cent. in 1931, when 11 per cent. were found to have died. The intensity of the infection in plots 1 and 2 in 1922 is indicated by the fact that on some of the larger and more heavily infected trees up to 1,800 cankers were found in plot 1 and 5,000 in plot 2. When compared with these figures, the relatively light incidence of the rust in plot 3 is considered to demonstrate the close relation of the intensity of pine infection to the distance from the source of sporidia on *Ribes*, most of the infection in this plot certainly originating from the few scattered neighbouring *R. lacustre* and *R. sanguineum* plants.

Special observations showed that some killing-back occurred in the new growth produced by the *Ribes* plants during the period in which the infected pines immediately associated with them remained alive and produced aecidiospores; normal growth was, however, resumed by these plants after the death of the pines.

DENNIS (R. W. G.). **A new species of Pestalotia on Podocarpus.**—*Phytopath.*, xxiv, 9, pp. 1026–1028, 1 fig., 1934.

The leaves of *Podocarpus elongata* in the Glasgow Botanic Gardens were observed in 1932 to be affected by a purplish-brown spotting, the areas involved tending to become greyish or silvery, and being surrounded by a well-marked brown line of demarcation from the healthy parts of the leaf. The fungus isolated from the diseased tissues on 2 per cent. malt agar was identified by Prof. E. F. Guba as a species of *Pestalotia* [*Pestalozzia*] to which the name of *P. podocarpi* n.sp. is assigned [with Latin and English diagnoses]. The same fungus is stated to be preserved in the herbarium of the Berlin Botanical Museum under the name of *P. funerea* Desm. [*R.A.M.*, viii, p. 605; xii, p. 332] *P. podocarpi* Sacc., nom. nud. The fungus has thick-walled, brown hyphae, and 4-septate, narrowly fusoid, straight or slightly curved conidia, tapering at both ends, 17·5 to 24·5 μ in length. The three median conidial cells are olivaceous or the upper two darker, 12 to 17·5 by 4·4 to 7 μ, the terminal ones conical, with three (or more rarely two) setae and a short pedicel.

ROBERTSON (W. A.). **Report of the Director of Forest Products Research for the year 1933.**—*Rept. Forest Products Res. Board for the year 1933*, pp. 4–58, 3 pl., 1 map, 1 graph, 1934.

In 1933, owing to the hot, dry summer the progress of dry rot (*Merulius lacrymans*) in the experimentally constructed house at the Forest Products Research Laboratory, Princes Risborough [*R.A.M.*, xiii, p. 196] was checked, but renewed activity was observed in November. Western red cedar [*Thuja plicata*] boards still showed no infection after being in contact with active dry rot for over twenty months in a hollow, unventilated floor where the moisture content of the wood reached 40 to 45 per cent. of the dry weight. Extensive rotting occurred in boards nailed to battens lying on or embedded in concrete and covered with impervious material, mostly due to *Coniophora cerebella* [*C. puteana*: ibid., xiii, pp. 70, 284], which appeared naturally, supplanting the originally introduced *M. lacrymans*, for which the conditions had become too moist. Excepting spread from adjoining decayed floors no decay took place in boards laid directly on a layer of bitumen above the concrete, although these were also under an impervious covering; the moisture content of the boards averaged 16 to 20 per cent., whereas in floors laid direct on the concrete up to 41 per cent. moisture was sometimes present. The 'well-constructed', suspended, ventilated floor developed no trace of rot, although for a third time each section was infected with a piece of wood containing *M. lacrymans* in active growth; the average moisture content of the timber was about 18·5 per cent., i.e., under the minimum requisite for the growth of this fungus.

Serious decay in the oak timbers of buildings was on several occasions due to a fungus provisionally identified as *Fomes cryptarum* [ibid., xii, p. 669].

Cultures from so-called 'brown' oak all gave the same fungus, and the condition is regarded as a very early stage of decay before the wood weakens or disintegrates. The fungus is unable to continue growth

after the tree is felled. A similar condition, associated with the same fungus, was observed in *Castanea sativa*.

The cause of a vivid, purplish-violet, rapidly spreading discoloration in white lead paints under moist conditions was determined as *Phoma pigmentivora* [cf. ibid., i, p. 276].

Decay fungi isolated from discoloured and rotted wood pulp included *Lenzites sepiaria*, *Lentinus lepideus* [ibid., xiii, pp. 70, 137], and *Peniophora gigantea*; the staining was mostly due to *Trichoderma lignorum* [ibid., xiii, p. 484].

Notes are given on the progress of laboratory tests of timber preservatives, the identification and physiology of wood-destroying fungi [ibid., xiii, p. 196], the chemistry of decay, and the fungal staining of timber.

McCrea (Adelia). **Longevity of Merulius lacrymans in wood destroyed by its growth.**—*Mycologia*, xxvi, 5, pp. 454–455, 1934.

In 1930 viable cultures of *Merulius lacrymans* were still obtainable both from the wood and the cloth upholstery of a car, the wood of which had crumbled owing to infection by the fungus, in a minor collision in 1928 after four or five years' use. Subsequent attempts have been positive only for the wood, the sporophore which had formed on the cloth apparently being dead. Assuming the fungus to have been present in the wood when the car was built, viability must have been maintained for ten to eleven years in the vegetative state as against two to three in the sporophore. Under the same unfavourable conditions, therefore, life persists considerably longer in the wood than in the fruit body. These facts are in conformity with Findlay's statement that difficulty in inducing germination in *M. lacrymans* spores is due to the use of spores that are no longer fresh [*R.A.M.*, xii, p. 607].

Eckersley (Audrey M.). **Some sap-staining organisms of Pinus radiata, D. Don, in Victoria, Australia.**—*Proc. Roy. Soc. Victoria*, (N.S.), xlvi, 2, pp. 179–194, 21 figs., 1 graph, 1934.

Three fungi have been isolated in Victoria from sap-stained *Pinus insignis* (*P. radiata*) boards and fruit-case timber, viz., *Hormonema dematioides* and *Ceratostomella* forms A and B [*R.A.M.*, xiii, p. 341], the first-named causing a neutral grey to green-black streaking and the others a greyish-blue discoloration of the surface. Pure cultures of the organisms reproduced the stains on clean *P. insignis* sapwood containing 100 per cent. of its oven-dry weight of moisture. A full description is given of the cultural characters and morphology of the three fungi and of their histological effects on the wood. A comparison with *C. pilifera* (Fr.) Wint. and *C. coerulea* Münch obtained from Baarn showed that all constitute a connected series, the two new forms being intermediate between the others. It is concluded that all four strains belong to the one fungus, which on grounds of priority should be known as *C. coerulea*.

Leach (J. G.), Orr (L. W.), & Christensen (C.). **The interrelationships of bark beetles and blue-staining fungi in felled Norway Pine timber.**—*Journ. Agric. Res.*, xlix, 4, pp. 315–341, 12 figs., 1 graph, 1934.

The results of field experiments since 1931 at Arago, Minnesota (some

of which were made under partly controlled conditions) showed that blue-staining fungi are introduced into felled Norway pine (*Pinus resinosa*) logs by the two bark beetles *Ips pini* and *I. grandicollis* [cf. *R.A.M.*, xiv, p. 68], and hardly ever by any other means. Only two species of blue-stain fungi were found to be associated with these beetles, namely, *Ceratostomella ips*, which is stated to be the most prevalent, and a species which apparently has not been described hitherto and which is named *Tubercullariella ips*, with a Latin diagnosis. It is characterized by hyaline, globose to piriform conidia, 13·3 to 23·8 by 7·9 to 22·5 μ, borne singly and successively at the ends of unbranched, septate conidiophores; the sporodochia are white and waxy but not mucilaginous. On agar, the fungus forms at first hyaline colonies, later changing to black, with a scant grey aerial mycelium.

Some of the isolations from stained wood and from the beetles yielded only a *Graphium* identical with the conidial stage of *C. ips*. Six out of 15 single ascospore cultures of *C. ips* also formed only conidia and failed to give perithecia when paired together in all possible combinations. Inside the logs, the fungus forms perithecia more commonly than conidia, but typical *Graphium* coremia were often found in the old egg channels or pupal chambers. The perithecial beaks point towards the centre of the channels, and when moisture conditions are favourable the spores ooze from the tips in sticky masses, this ensuring their adherence to the body of the newly hatched beetles as they emerge from the pupal chambers. It was shown that the beetles eat the ascospores and even parts of the perithecia, and that the spores retain their viability after passage through the intestinal tract.

In addition to the blue-staining fungi, characteristic yeasts were also constantly associated with the beetles. The latter were further shown frequently to introduce into the logs mites, which were also found to carry yeast cells and spores of the fungi on their bodies, thus contributing to the distribution of these organisms inside the logs.

KAMESAM (S.). **A record of the results obtained with experimental treated sleepers laid in the Indian railways between 1911 and 1916.** —*Forest Res. Inst., Dehra Dun, Forest Bull.* 85, 35 pp., 1934.

A detailed, fully tabulated account is given of the results of experiments carried out from 1911–16 in the preservation of Indian railway sleepers [cf. *R.A.M.*, xiii, p. 284].

Powellizing with a solution of white arsenic and molasses has given excellent results, especially in dry areas, while impregnation with a high-boiling creosote or carbolineum, diluted with a suitable oil medium, was also promising, but zinc chloride was less satisfactory.

The author states that the Indian railway companies have a high opinion of the creosote-crude oil treatment, which has in fact become standardized during the last decade. In view, however, of the very high cost of this material (over twice as much in India as in England), it may be well to consider the possibility of arsenic (preferably mixed with copper to ensure a high degree of fixation), a far cheaper but apparently equally efficacious treatment, which is stated to be widely used in South Africa and Australia.

WILLIAMS (R. R.). **Chemical studies of wood preservation. I. The problem and plan of attack.**—*Indus. & Engin. Chem.* (*Analyt. Ed.*), vi, 5, pp. 308–310, 1934.

The chemical problems involved in wood preservation are discussed with special reference to southern pine [*Pinus palustris*] telephone poles treated by pressure with creosote oil. The principal cause of loss of preservative value in creosote oil is evaporation, and in order to gauge the extent of this process an evaporimeter has been developed for measuring the rate of evaporation of an oily preservative under conditions simulating those obtaining in nature. The instrument further supplies material for the estimation of residual toxicity at various stages of evaporation.

WATERMAN (R. E.), WELLS (C. O.), & PEEK (R. L.). **Chemical studies of wood preservation. II. Sampling poles for chemical analysis.**—*Indus. & Engin. Chem.* (*Analyt. Ed.*), vi, 5, pp. 310–314, 4 figs., 2 diags., 1 graph, 1934.

In the course of protracted studies of the quantitative and qualitative changes in creosote oil preservatives in southern pine [*Pinus palustris*] poles [see preceding abstract], it has become evident that the analysis of samples indiscriminately taken from timbers may lead to gross errors. A true sample of a round timber must contain a volume of each annual growth ring proportional to its distance from the centre of the tree and must further represent each sector of cross section of the timber. The desired result may be approximated by taking increment borer cores round the circumference of the timber and bisecting each core in such a way that the segments removed for analysis are similar to wedges in their significant geometrical features. The application of this method of sampling is illustrated by means of equations.

RUDGE (E. A.). **An inquiry into the mechanism of decay of wood.**—*Journ. Soc. Chem. Ind.*, liii, 36, pp. 282T–287T, 1 graph, 1934.

In continuation of his work on the chemical decay of timber [*R.A.M.*, xiii, p. 816], the author suggests that certain compounds, notably the bicarbonates, react with cellulose by a mechanism assumed to be similar to that of the thiocarbonates in the chemistry of viscose silk, and the inference is drawn that decay through the agency of the bicarbonates follows a repeated cycle of reactions under alternately wet and dry conditions. Methods of timber preservation depending solely on antiseptic action are inadequate to protect the wood against chemical disintegration, which may, however, be indefinitely arrested by preventing the completion of the above-mentioned cycle of changes. Thus, continuous immersion in water will prevent the oxidation process even in the presence of high concentrations of bicarbonates, while the formation of bicarbonate complexes is suppressed by the maintenance of a dry condition. It is significant that the factors governing ionic disintegration and fungal development are identical. The author has been able to induce rotting in spruce, *Liriodendron* [*tulipifera*], and oak by ionic infiltration under aseptic conditions.

ROBAK (H.). **Om sopp i tremasse og følgene av det såkaldte 'lukkede' system.** [Mould in pulp and the consequences of the so-called 'closed' system.]—*Papir-Journ.*, Oslo, xxii, 4, pp. 42–45; 5, pp. 51–54, 1934.

Wood pulp is stated to be always infected by moulds when it leaves the pulping machine, the sources of contamination being the wood, water, and air. Warm-ground pulp is practically sterile when it leaves the stones, so that in this system the wood plays a negligible part as a carrier of infection. However, the spore count of the water may be sufficiently high to explain the heaviest infection, e.g., by blue-staining fungi [*Ceratostomella* spp., *Cadophora fastigiata*, *Lecythophora lignicola*, *Trichosporium heteromorphum*, &c.: *R.A.M.*, xii, p. 69; xiv, p. 69], the spores of which, according to Melin's unpublished researches in Sweden, may number 3,000 per c.c. Air has been found relatively unimportant as a source of infection compared with water, especially where the 'closed' grinding system is employed. The risks of infection may be effectively eliminated by a closed and covered system, keeping the temperature above 50° C., filtering the fresh water through sand filters, and sterilizing it with a chlorine compound.

FAJARDO (T. G.) & PALO (M. A.). **A serious leaf spot of Chinese Celery Cabbage, Wongbok, and other cruciferous plants in Trinidad Valley, Mountain Province, Luzon.**—*Philipp. Journ. of Agric.*, v, 3, pp. 143–156, 4 pl., 1934.

A grey leaf spot of Chinese celery cabbage (*Brassica pekinensis*) and other crucifers, identical with that described by Weimer as due to *Alternaria herculea* [*A. brassicae*: *R.A.M.*, vi, p. 202; xiii, p. 3], has been observed in Mountain Province, Luzon, Philippine Islands, causing up to 100 per cent. infection in the field and severely damaging the plants. The colour and size of the spots vary according to the host from pale grey to dark brown and from 0·5 to 12 mm. Spontaneous infection has been found on *B. chinensis*, mustard, turnip, radish, cabbage, and broccoli in addition to *B. pekinensis* in the Trinidad Valley and environs of Baguio, the fungus being most virulent during the cool, moist season but apparently remaining active to some extent throughout the year. Slight morphological and cultural differences were detected between the strains of *A. herculea* from the various hosts, but these are not considered to justify specific distinction. Besides the usual cultural measures of control, including prolonged crop rotation and the use of healthy seed, spraying with 2–2–50 or 3–3–50 Bordeaux mixture is recommended.

REID (W. D.). **Production of wilt-free Beans.**—*New Zealand Journ. of Agric.*, xlix, 3, pp. 164–169, 3 figs., 1934.

Although no suitable seed treatment has yet been devised in New Zealand against bacterial wilt [*Bacterium medicaginis*: *R.A.M.*, xi, p. 418] of beans, clean seed has now been obtained by selection.

In trial plots laid down in October, 1931, the disease was confined to Canadian Wonder lines and one line of butter beans [*Phaseolus vulgaris*], the Epicure, Zebra runner and scarlet runner [*P. multiflorus*] varieties remaining unaffected, though in an earlier test the last-named had been susceptible.

At first, most of the affected plants were adjacent to points of primary infection, and the amount of disease present was governed mainly by the number of seedling infections. The disease slowly progressed from these centres, generally along the drills, but when the plants were closely set it spread over a circle two to three feet in diameter in seven to ten days. A space of at least two chains was necessary to prevent spread. When all the plants were rogued out within two or three feet from a diseased plant the recurrence of the disease was reduced. More thorough roguing later provided many disease-free lines.

Next season, fifteen of these clean lines were sown in three localities, one being remote from other cultivated land, while in the others the plots were close either to an infected control crop or to market gardens; no disease appeared in the first district, but in the other two, five out of eleven plots became affected. Three of the infected crops were the progeny of crops that had remained healthy the previous season. Finally, two plots had remained clean, and five appeared to be clean after roguing.

In 1933–4, plots on farms in six localities were sown with seed from the previous test crops, three of which had been infected and rogued in 1932–3, one infected and rogued in 1931–2, but uninfected the following year, while two had remained throughout clean. All the plots, which ranged from $\frac{1}{8}$ acre to two acres in area, were sown, cultivated, and harvested by the farmers, and all remained free from wilt.

GÄUMANN (E.). **Zur Kenntnis des Uromyces fabae (Pers.) de By.** [A contribution to the knowledge of *Uromyces fabae* (Pers.) de By.]—*Ann. Mycol.*, xxxii, 5–6, pp. 464–470, 1934.

A new form of *Uromyces fabae* (f. sp. *viciae sepium*) [cf. *R.A.M.*, xiii, p. 670] on *Vicia sepium* in the Zürich district of Switzerland is described. It was shown by cross-inoculation experiments to infect broad beans (*V. faba*) heavily and *V. monantha* [*V. calcarata* Desf.] mildly.

WIMMER (G.) & LÜDECKE (H.). **Ist Bormangel die Ursache der Herz- und Trockenfäule der Zuckerrüben?** [Is boron deficiency the cause of the heart and dry rot of Sugar Beets?]—*Zeitschr. Vereins Deutsch. Zuckerind.*, lxxxiv, 9, pp. 627–666, 12 figs., 1934.

The writers' observations and experiments [the results of which are fully discussed and tabulated] on the effects of boron applications on the heart and dry rot of beets [*R.A.M.*, xiv, p. 73] lend no support to the view that the absence of this element from the soil is the cause of the disease. Such beneficial action as it exerts is of a stimulatory and not of a curative nature—a statement applicable also to its alleged improvement of a tomato disorder analogous to heart and dry rot of beets [ibid., xii, p. 3].

LEACH (L. D.) & BORTHWICK (H. A.). **Distribution of downy mildew mycelium in Spinach fruits.**—*Phytopath.*, xxiv, 9, pp. 1021–1025, 1 fig., 1 diag., 1934.

The examination of spinach fruits at the University of California revealed the presence of abundant mycelium of downy mildew (*Perono-*

spora effusa) [*R.A.M.*, xii, p. 417] in the calyx tube, funiculus, integument, and nucellus. The ovule is invaded through the funiculus, whence the mycelium passes into and spreads through the integuments. The nucellus becomes infected by mycelium entering through the chalaza. In a limited number of germination trials no evidence of the transmission of *P. effusa* by the seed was obtained.

WILSON (J. D.). **Celery yellows in Ohio.**—*Ohio Agric. Exper. Stat. Bimonthly Bull.*, 168, pp. 109–115, 2 figs., 1934. [Abs. in *Exper. Stat. Record*, lxxi, 5, pp. 654–655, 1934.]

Celery yellows (*Fusarium* sp.) was found to be prevalent on the susceptible tall strain of Golden Self Blanching at a temperature range of 20° to 32° C. in Ohio [*R.A.M.*, xii, p. 416; xiii, p. 685], the optimum for the fungus being above 28°. Field trials in 1932–3 showed the green variety, Columbia, to be very resistant, as was also Michigan Golden, a selection of the tall strain of Golden Self Blanching. A fair degree of resistance was further manifested by Florida Golden and Golden Prize (intermediate in character between the true green and yellow types) in addition to others previously mentioned.

BALDACCI (E.). **La batteriosi del Sedano da Bacillus carotovorus Jones.** [Celery bacteriosis caused by *Bacillus carotovorus* Jones.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, v, pp. 77–119, 10 figs., 1934. [Latin and English summaries.]

Celery in the vicinity of Voghera, northern Italy, has for some years been attacked by a disease which has steadily become worse, until in 1933–4 the loss amounted to over 60 per cent. of the crop. In the field the affected plants occurred in irregular patches or along the rows, and the plots became affected one after another, apparently in relationship with the course of the irrigation water. In practically all the plots celery had been grown without rotation for several years in succession, and there was no obvious influence on the disease of the type of soil.

The leaves and stalks of the affected plants turned prematurely yellow or greenish-yellow, the discoloration rapidly progressing from the inner to the outer leaves. The part covered over by the earthing-up process was flaccid and the heart and crown developed a soft, brownish, later almost black, rot which extended to the roots; the plants were ultimately reduced to a semi-fluid, evil-smelling mass.

In the early stages of the disease yellowish, punctiform, collapsed necrotic areas, outwardly invisible, measuring 2 to 3 mm. in diameter, extended from the point of insertion along the vascular bundles of the leaf stalks. Below the point of insertion there was a softening of the crown tissues which spread inwards, while in the heart softening was mainly in the peripheral tissues.

From affected material the author isolated *Bacillus carotovorus* (*B. apiovorus*) [*R.A.M.*, vii, p. 218; x, p. 79], the cultural, morphological, and biochemical characters of which are described, and inoculations with which reproduced the disease on healthy celery plants. Comparison with four strains of *B. carotovorus* from the National Collection of Type Cultures, London, revealed the general similarity of the symp-

toms produced by all the strains on celery, but the author's strain showed different cultural characters from the others.

From its physiological and cultural characters and the symptoms produced by it on celery, as described in literature, the author considers that *Bacterium apii* (Brizi) Migula is identical with *B. carotovorus*. The cultural characters described by Jagger in *Bact. jaggeri* Stapp [ibid., xiv, p. 16], the causal organism of a celery leaf spot not yet reported from Italy, are quite different from those of all the strains of *B. carotovorus* examined, and the two organisms are considered to be distinct. A table is given showing the cultural characters of the five strains of *B. carotovorus*, *Bact. apii*, and *Bact. jaggeri*.

A bibliography of 58 titles is appended.

Uppal (B. N.). **The adsorption and elution of Cucumber mosaic virus.**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 656–662, 1934.

An account is given of experiments conducted to ascertain whether the non-filterability of the cucumber mosaic virus [*R.A.M.*, xiii, p. 545] through Pasteur-Chamberland candles indicates a high degree of adsorption of the infective agent on the walls of the pores and on other similar substances. The results obtained [which are tabulated and discussed] showed that the passage of the virus extract through a sand and pulp filter or fuller's earth rendered the filtrate non-infectious to tobacco and cucumber. Adsorption readily occurred when kaolin or fuller's earth was added to the virus extract even in such small quantities as 0·125 gm. per 100 c.c. The virus was inactivated when the P_H value of the medium was less than 5, being active only between (approximately) P_H 5 and 9. Adsorbed to fuller's earth it was freed *in vitro* in an active state by altering the P_H value of the suspension to one between 6 and 6·7; when the medium was more acid than P_H 6, no infection was obtained. When the residue was treated with an ammonia solution the supernatant liquid was non-infectious, but the virus was released in an active stage by changing the P_H value of the suspension to acidity, i.e., to 6 to 6·7. It therefore appears that the adsorption and inactivation of the cucumber mosaic virus are reversible phenomena.

Yoshii (H.). **Pathological studies on Watermelon wilt. III. The pathological anatomy of the diseased seedling. IV. The pathological anatomy of the affected plants.**—*Bull. Sci. Fakultato Terkultura, Kjusu Imper. Univ.*, vi, 1, pp. 1–33, 17 figs., 1934. [Japanese, with English summary.]

The examination at Kyushu, Japan, of serial sections of watermelon seedlings planted in soil infested with wilt (*Fusarium niveum*) and removed at the first sign of wilting [*R.A.M.*, xiii, pp. 419, 560], revealed the presence of the mycelium in irregular, often isolated colonies along the vascular bundles, extending at times into the cortical parenchyma and collenchyma. The marked irregularity of the mycelial development along the vascular bundles is considered to be the result of microconidial migration from the lower part of the infected vessel along with the transpiration stream. Some correlation was noticed between the extent of fungal growth along the vascular bundles and the loss of turgidity or necrosis of the surrounding parenchymatous tissues, externally

manifested as wilting. The soft rot observed in certain seedlings was found to be the result of an extension of the fungus from the vessels into the parenchymatous tissues.

Similar studies of mature plants showed that *F. niveum*, entering the host at the tip of the rootlet, rapidly invades the vascular tissue and eventually fills the disintegrated stele with mycelium. The majority of the secondary roots produced by the diseased primary one may become infected before their tips traverse the cortical parenchyma of the mother root. These pathological changes are mostly followed by wilting of the plants as soon as the soil moisture content decreases to a certain point. In some cases, however, even a heavy infection of a limited number of the rootlets does not necessarily lead to a generalized extension of the wilt, possibly owing to the exclusion of the pathogen from the upper healthy roots by premature suberization of the exo- and endodermis and the formation of tyloses within the affected vessels. The cortical parenchyma and the leptome of the main roots and stems of diseased watermelon plants gradually disintegrate and shrivel into brown, flattened forms. The medullary ray, pith parenchyma, and cambial cells first undergo hypertrophy and then disintegration, forming large cavities often occupied by resinous substances. Similar changes generally occur at an earlier stage in the hadrome, but the direct cause of the wilt is not, in the writer's opinion, to be sought in these phenomena. From the vessels behind the invaded root tip the fungus reaches the upper vessels by microconidial migration, and the mycelium arising from these conidia may pass through the pits into the surrounding tissues, causing them to collapse and thus impairing the water-conducting function of the bundle. No suberization takes place round the diseased tissues of mature plants, so that the mycelium is readily able to penetrate the cell walls. The absence of a protective mechanism in older plants, such as is found in seedlings, is attributed mainly to the toxic action on the tissues of one or more substances secreted by the vigorously growing mycelium.

Mitra (M.). **Wilt disease of Crotalaria juncea Linn. (Sann-Hemp).**—*Indian Journ. Agric. Sci.*, iv, 4, pp. 701–714, 1934.

Details are given of experiments from 1932–4, the results of which showed that under the conditions prevailing in Pusa the wilts of sann-hemp (*Crotalaria juncea*) and of pigeon pea (*Cajanus indicus*) are chiefly caused by similar biological strains of *Fusarium vasinfectum* [*R.A.M.*, xii, p. 567], cultures from either host being capable of infecting the other though with diminished virulence. These strains do not attack cotton, nor can the strain from cotton [ibid., v, p. 768] infect either sann-hemp or pigeon pea. The fungus is frequently carried on the seed from infected plants, and seed disinfection with uspulun or mercuric chloride is recommended.

Wilting of sann-hemp and pigeon pea is also caused in Pusa to a minor extent by *Rhizoctonia* [*Corticium*] *solani* and *Neocosmospora vasinfecta* [ibid., vi, p. 123; ix, pp. 33, 736], especially during the earlier, warmer part of the season. Pot experiments in which the soil was inoculated with *N. vasinfecta* are considered to show that this fungus can cause a high percentage of wilt in sann-hemp.

ZACHAREWICZ (E.). **Pourriture grise. Comment la combattre.** [Grey rot. How to control it.]—*Prog. Agric. et Vitic.*, cii, 35, pp. 229–231, 1934.

The author states that serious outbreaks of grey rot of grapes (*Botrytis cinerea*) usually occur in low-lying, poorly aerated vineyards in the plains, at the time when the grapes begin to change colour prior to the final maturation period, and that the disease is particularly dangerous to the thin-skinned and juicy varieties. The trouble may be considerably reduced by pruning so that the fruiting branches are kept rather high up on the stocks, and by thinning out the foliage at the base of the stock, where it is too dense, to ensure a better circulation of air around the fruit. The best control, however, is obtained by dusting the bunches with a copper-containing dust, such as, for instance, that composed of 55 kg. calcined plaster of Paris [calcium sulphate], 40 kg. sulphosteatite with 20 per cent. copper sulphate, and 5 kg. saponaphtha powder. The dustings should be done after spraying the vines with Bordeaux mixture, as soon as the spray is dry.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1933.** [Annual report for 1933 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Ann. Agric. de la Suisse*, xxxv, 8, pp. 919–962, 2 figs., 3 graphs, 1934.

Brief notes of general phytopathological interest are given on the occurrence and control of the diseases of vines, other fruits, and miscellaneous cultivated plants in the vicinity of Lausanne during 1933 [cf. *R.A.M.*, xiii, p. 77].

PARK (M.). **Report on the work of the Mycological Division.**—*Ceylon Administration Reports, Report of the Director of Agric. for 1933*, pp. D126–D133, 1934.

In 1933, areca palms (*Areca catechu*) in Ceylon developed a disease marked by a dwindling or tapering of the leaves, which turned an unhealthy green, those produced subsequently becoming progressively smaller, until the head was considerably reduced; the yield of nuts from the affected trees declined rapidly. The symptoms suggest that this disease may be caused by a virus.

A thick cover of *Dolichos hosei* [*Vigna oligosperma*] favoured the swift spread of *Fomes lignosus* on *Hevea* rubber [*R.A.M.*, viii, p. 333]. Bitten leaf of coco-nuts (*Ceratostomella paradoxa*) [ibid., vii, p. 629; xiii, p. 79], recorded for the first time in Ceylon, was frequently followed by a secondary rot of the 'cabbage', with resultant destruction of the bud, at which stage the disease may be confused with bud rot [*Phytophthora palmivora*: ibid., xii, p. 77]; inoculations with pure cultures of *C. paradoxa* gave positive results only through wounds.

As spraying, though it considerably reduced citrus canker [*Pseudomonas citri*: ibid., xiii, p. 78], did not prevent considerable damage, an experiment was conducted in which every infected leaf, twig, and fruit was systematically removed; the trees remained clean and reinfection became progressively rarer.

When citrus trees were inoculated with pure cultures of *Corticium salmonicolor* isolated from apple and citrus twigs parasitism was equally pronounced in each case, indicating the absence of biological strains; positive infection was readily obtained without wounding.

Other new records include *Ustulina zonata* causing a root disease of areca palms, *Oidiopsis taurica* [ibid., xi, p. 183; cf. also xii, p. 747] on *Capsicum annuum*, *Gloeosporium* (?) *limetticolum* causing anthracnose of immature orange fruits, soft rot of turmeric (*Curcuma longa*) due to *Pythium* (?) *butleri*, species of *Oidium* on *Hydrangea hortensia* and *Manihot dichotoma*, *O.* (?) *balsamii* on green gram (*Phaseolus aureus*), *Bacterium solanacearum* on *Physalis peruviana*, and a soft rot of ginger caused by *P.* (?) *butleri*.

STOREY (H. H.). **Report of the Plant Pathologist.**—*Sixth Ann. Rept. East African Agric. Res. Stat., Amani, 1933–34*, pp. 10–14, 1934.

Recent researches on maize streak are stated to admit of an alternative explanation of the continued infectivity of the insect vectors (*Cicadulina mbila* and *C. zeae*) receiving no additional supply of virus to that involving multiplication of the infective principle within the insect's body, and the writer now regards the question whether there is such a multiplication as an open one [*R.A.M.*, xii, p. 748; xiii, p. 571]. Complete inactivation of the streak virus has been obtained by the addition of methylene blue (1 in 10,000 or 1 in 100,000) and exposure to diffuse daylight [see below, p. 186].

Satisfactory evidence has been secured under carefully controlled greenhouse conditions that cassava mosaic [ibid., xii, p. 748] is transmitted by a species of whitefly (Aleyrodidae). All the cassava varieties at present available have been shown by grafting experiments to be susceptible to mosaic, including six from Uganda originating in the West Indies and two from the Gold Coast, the latter being highly resistant in their native locality but susceptible to graft infection at Amani.

Botany. *Ex* Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1933.—*Missouri Agric. Exper. Stat. Bull.* 340, pp. 28–34, 1934.

Among other items of phytopathological interest in this report the following may be mentioned. C. M. Tucker and C. G. Schmitt controlled damping-off of tomato seedlings caused by *Pythium de Baryanum* [*R.A.M.*, viii, p. 140] by the application to the soil of Du Bay 738, containing ethyl mercury phosphate as the active ingredient [ibid., xi, p. 491; xiv, p. 74], at the rate of 1 gm. per 5 in. pot. Some stunting and delay in germination resulted from the treatment, but after 30 days the number of healthy seedlings exceeded those in the control pots by more than 2½ times. The fungicide proved less effective in an acid (P_H 5·6) than in an alkaline soil (up to P_H 8·5), probably on account of the combined inhibitory action on the seedlings of the mercurial and the toxic sulphurous ion from the sulphuric acid with which the pots were supplied in the former series.

Bacterium [*Pseudomonas*] *tolaasii* caused a spotting of cultivated mushroom [*Psalliota campestris* and *P. arvensis*: ibid., xiii, p. 213] caps.

Sclerotium delphinii [ibid., xiii, p. 387] was examined by C. M. Tucker on *Delphinium* spp., *Physostegia virginiana*, *Lilium regale*, and *Iris* spp., and it was also isolated from soil. The largest sclerotia were formed on onion agar. The optimum temperature for growth was found to lie between 30° and 35° C., with a maximum at 37·5° to 40° and a thermal death point of 48° to 50°. Sclerotia stored for four months at various temperatures between 3° and 37·5° remained viable, as did those exposed to outdoor winter temperatures. The optimum hydrogen-ion concentration for growth of *S. delphinii* was found to be about P_H 4·5. A comparison of this fungus with *S. rolfsii* from Florida indicated that the two species are distinct. *S. delphinii* was killed in five minutes by 0·0105 per cent. ethyl mercury phosphate (Du Bay).

During the period under review C. M. Tucker also made cultural studies on 58 strains of *Phytophthora* received from various parts of the United States, South Africa, India, Japan, Scotland, Holland, and Burma. Among the more interesting identifications on new hosts are *P. parasitica* on *Piper betle* (Burma) [ibid., xiv, p. 122] and on *Lilium elegans* (Japan), *P. cinnamomi* [see below, p. 194] on chestnut (*Castanea dentata*) in the south-eastern United States, *P. cactorum* on loquat and *L. dauricum* (Japan), and *P. drechsleri* [ibid., x, p. 755] on sugar beet in Utah and California. In Boone County, Missouri, species of *Phytophthora* not yet identified were isolated from *Nigella damascena*, *Campanula persicifolia*, *Gypsophila paniculata*, *L.* spp., *D.* spp., and carnations. Two of the thirteen isolations from *N. damascena* produced oospores in oogonia with paragynous antheridia at 25°. Wounded apple fruits were infected by these strains as well as by the eleven from the same host producing only chlamydospores and sporangia. About half the latter also proved pathogenic to potato tubers, causing the infected tissue to turn pink on exposure to air. Both groups attacked the *Nigella* plants through stem or root wounds and through the soil, causing cortical softening and blackening.

Garden, orchard and cash crops. Plant diseases. *Ex* Our changing agriculture served by science. Annual Report of the Director Wisconsin Agricultural Experiment Station 1932–1933.—*Wisconsin Agric. Exper. Stat. Bull.* 428, pp. 76–96, 4 figs., 1 graph, 1934.

In addition to items already noticed from other sources, these sections of the Wisconsin agricultural report for 1932–3 contain much information of interest. Very promising results have been obtained by J. Johnson and F. S. Henika in the development of tobacco strains combining the desirable qualities of Havana No. 38 with the resistance to black root rot [*Thielaviopsis basicola*: *R.A.M.*, viii, p. 613; xiii, p. 13] of Havana 142.

J. W. Brann compiled data showing a steady advance in the health of seed potatoes as a result of the tuber index method of mosaic detection [ibid., xii, p. 50]. The Triumph variety suffers particularly severely from mosaic, the incidence of which, however, may be much reduced by the use of northern-grown seed. Yellow dwarf [ibid., xiii, p. 721] has been found by J. C. Walker and K. Koch to be responsible for heavy reductions in the potato yield. The eye index method extensively used for crinkle detection [ibid., xii, p. 50] cannot be applied to yellow dwarf,

signs of which may be apparent on one section of a tuber and not on another; it is necessary, therefore, to examine the entire tuber to be sure of freedom from the disease.

Full details are given of observations by G. W. Keitt and collaborators pointing to the importance of rain in the dissemination of fire-blight (*Erwinia amylovora*) [*Bacillus amylovorus*] on the blossom and twigs of apple trees. Apple scab [*Venturia inaequalis*] on the Dudley and Wealthy varieties was well controlled by six applications of 1 in 40 or 1 in 60 lime-sulphur, 5–50 flotation sulphur, and 3–50 or 2–50 colloidal sulphur, infection being reduced from 91·7 and 73·6 per cent., respectively, to less than 1 per cent.

A. J. Riker and co-workers found that glucose is utilized by the crown gall and hairy root bacteria [*Bacterium tumefaciens* and *Bact. rhizogenes*: ibid., xiii, p. 776] for cell, gum, carbon dioxide, and acid formation, acid being produced much more abundantly by the latter organism; the volatile acid was ascertained to be acetic and the non-volatile pyruvic.

W. H. Pierce and J. C. Walker have developed two bean [*Phaseolus vulgaris*] lines from crosses between Corbett Refugee and Refugee Green [ibid., xiii, p. 488] combining mosaic resistance and other desirable features; they are named Idaho Refugee (early) and Wisconsin Refugee (late). All the F_1 plants in these crosses proved resistant to mosaic, but in the F_2 15 per cent. reverted to the susceptible condition.

Fusarium yellows of celery [see above, p. 142] has been reported from several sections of the State.

In a series of tests by J. C. Walker and R. H. Larson on the varietal reaction of cabbage, swedes, and turnips to club root (*Plasmodiophora brassicae*) [ibid., xiii, p. 9], no indication of resistance was found in any strains or individuals of the first-named. Complete resistance was shown, however, by all the four swede varieties tested, viz., White Russian, White Neckless, Wilhelmsburger, and Bangholm, and by two turnips, May and Snowball; 88 per cent. resistant plants were further found among the Purple Top White Leaf and Purple Top Strap Leaf varieties [cf. ibid., xiii, p. 343] and 84 per cent. in Cowhorn, while Shogoin was entirely susceptible.

J. C. Walker and W. C. Snyder ascertained by means of experimental plantings that the pea wilt fungus (*F. orthoceras* var. *pisi*) [ibid., xiv, p. 71] is much more prevalent in sandy than in silt loam or red clay soils.

Field crops. *Ex* Our changing agriculture served by science. Annual Report Wisconsin Agricultural Experiment Station 1932–1933.—*Wisconsin Agric. Exper. Stat. Bull.* 428, pp. 65–75, 3 figs., 1934.

The following items of phytopathological interest occur in this report. From a large number of hybrid oat varieties resistant to smut [*Ustilago avenae*] supplied by the United States Department of Agriculture, 19 lines have been selected by J. G. Dickson, B. D. Leith, and H. L. Shands as promising for Wisconsin. To date the numbers of selected lines at the Station are 448 for rust [*Puccinia lolii*] resistance, 139 for smut resistance, and 14 for combined resistance to smut and rust [cf. *R.A.M.*, xiii, p. 434].

R. A. Brink, H. R. Albrecht, and F. R. Jones have found in the course of extensive breeding tests that the capacity of individual lucerne plants

to transmit their own high degree of resistance to bacterial wilt (*Aplanobacter insidiosum*) [ibid., xiv, p. 109] varies extremely, indicating the complexity of the genetic basis for the character. Several crosses between typical Grimm (susceptible) plants and resistant individuals of Turkestan origin resulted in less than 10 per cent. resistant progeny in the F_2 generation. On the other hand, two similar crosses in which the susceptible parents were of the Hardy Peruvian variety gave a larger number of resistant offspring, comparable results being also obtained with a Turkestan × *Medicago falcata* hybrid. It would appear from these data that the Grimm variety carries a complex of genes conditioning reaction to wilt that greatly limits the number of resistant segregates in crosses with highly resistant types.

Botany and plant pathology section.—*Ann. Rept. Iowa Agric. Exper. Stat. for the year ending June 30, 1933*, pp. 44–58, 2 figs., 1933. [Received December, 1934.]

Among the numerous items of interest in this report, some of which have already been noticed from other sources, the following may be mentioned. C. S. Reddy and E. W. Lindstrom found that the critical hydrogen-ion concentration for the infection of maize cobs by *Basisporium gallarum* [*Nigrospora* sp.: *R.A.M.*, xii, p. 268; xiii, p. 299] is P_H 5·2, above which point little rotting of the ears occurs in inbred lines.

Thirty-three physiologic forms of crown rust of oats [*Puccinia lolii*] have been identified by H. C. Murphy among 533 collections from 29 of the United States, three Canadian Provinces, and three Mexican States during the period 1927–32, forms 1 and 7 being again the most widespread in the year under review [ibid., xii, p. 269]. These two forms consistently overwintered in the south, the former also overwintering on *Rhamnus lanceolata* in the north. Form 3, the next in order of prevalence, appears to depend for its initial spread to oats on *R. cathartica*. A new and important form, 33, apparently arose as a mutant of 1.

In laboratory tests by R. H. Porter, E. O. Brown, and C. M. King, the average percentage of scab (*Gibberella saubinetii*) on barley seed-grain [ibid., xii, p. 614] was 9·6 and the highest 36·5; in 20 farmers' seed lots there was an average of 5·5 per cent. infection (10 per cent. when estimated by the blotter test). When seed samples of Colsess, Glabron, Spartan, Velvet, and Minsturdi were planted in sterile soil, the average percentages of weak and blighted seedlings were 18 and 17·8, respectively, indicating a close relationship between the two classes.

In 1932 *Cercospora beticola* [ibid., xiii, p. 415] was first observed in northern Iowa on 22nd July, from which date onwards extensive data were collected by S. M. Dietz pointing to the origin of infection in centres throughout the field, spread being more rapid and the symptoms more severe in drilled than in checked plots; the yield from the latter averaged 2·8 tons per acre more than from the former. The following plants showed spontaneous infection by *C. beticola* in the field: *Amaranthus retroflexus*, *Chenopodium album* [ibid., xii, p. 269], *Malva rotundifolia*, *Polygonum convolvulus*, *Melilotus alba*, and lettuce. The outcome of preliminary trials indicates that the fungus is soil-borne and able to initiate infection from the soil on young beet leaves.

The sweet potato slip disinfectants, semesan bel, semesan, and corona PD 7, reduced the total percentage of stem rot [*Fusarium batatatis* and *F. hyperoxysporum*: ibid., xi, p. 535] from 51·7 to an average of 33·1 in D. V. Layton's tests, the average yield per acre from the treated material being 195·8 bushels compared with 170·8 from the controls.

Phoma terrestris was found by I. E. Melhus and W. J. Henderson to be the primary agent of onion bulb rot, with *F. zonatum* as a secondary invader [ibid., xii, p. 269]. Both fungi grow best between 26° and 29° C., the optimum hydrogen-ion concentration for the development of the former being P_H 4·2 to 7·0 and for the latter 5·0 to 6·0.

G. L. McNew states that in addition to the common red cedar [*Juniperus virginiana*], the silver cedar (*J. scopulorum*) is also susceptible to the cedar rust, *Gymnosporangium* [*juniperi-virginianae*: ibid., xiii, p. 780], but all *J. communis* and *J. chinensis* varieties investigated appear to be resistant. Of the ten common apple varieties exposed to infection by rust collections from 26 localities, Delicious and Northwestern Greening were the most resistant, followed by Tolman's Sweet. *Phomopsis* blight of red cedars caused over 14 per cent. mortality in one summer on three-year-old seedlings, and was present on nearly 95 per cent. of older trees in the field. Good control was obtained by excision of the diseased material and spraying with Bordeaux mixture and a miscible oil (1 in 200).

The same worker's experiments (covering a four-year period and involving the use of 34 preparations) on cherry yellow leaf (*Coccomyces hiemalis*) control in 75 blocks of one-year-old trees showed that Bordeaux mixture 4–6–50, preferably with the addition of calcium caseinate or a miscible oil, is the most generally satisfactory treatment, applied at ten-day intervals from the time the seedlings are 6 in. high until the middle of August or later. In two nurseries the records for two years show that the treatment of each tree costs about ½ cent and confers an increased value of 1 to 3 cents by the end of the first season.

MARTIN (W. H.). **Plant pathology.**—*Fifty-third and fifty-fourth Ann. Repts.* (*First Bienn. Rept.*) *New Jersey Agric. Exper. Stat. for the 2-year period ending June 30, 1933*, pp. 57–66, [? 1933. Received December, 1934.]

This report contains much useful information, some of which has already been noticed from other sources; the following may be mentioned here. Promising results in the control of scab [*Actinomyces scabies*] and *Rhizoctonia* [*Corticium*] *solani* on potatoes were given by the incorporation with the fertilizer of calomel [mercurous chloride] and yellow oxide of mercury at the rate of 3 and 6 lb. per ton, but there was a tendency to retarded germination and reduced yield in the case of the larger doses [*R.A.M.*, xi, p. 355; xiv, p. 118]. In a test to determine the effect of planting depth and soil moisture content on the incidence of *C. solani*, the largest amount of severe infection (67·4 per cent.) occurred at 5½ in. with a moisture content of 60 per cent.

A copper fungicide, coposil, reduced the amount of apple scab [*Venturia inaequalis*] from 81 to 4 per cent. In 1932 flotation sulphur in powder form proved to be equally effective in scab control with the paste [ibid., xiii, p. 34, 358]; used at proper concentrations from the

pink application onwards this fungicide was equally efficacious with lime-sulphur 1 in 50 and caused practically no burning. Bentonite sulphur [ibid., xiii, p. 715] was as useful as any of the standard sulphurs for the control of scab, and adhered slightly better than flotation sulphur for the first ten days after spraying. The best adhesion, however, was obtained with lime-sulphur. Dry lime-sulphur was as good as the liquid form against scab but caused serious defoliation. Brooks's fruit spot [*Mycosphaerella pomi*: ibid., xi, p. 355; xiii, p. 171] was well controlled by Bordeaux mixture 1–4–50, but not by any of the sulphur sprays; coposil was effective against this disease, and caused no injury to foliage or fruit either alone or in combination with 0·5 per cent. oil as a summer spray.

A high degree of resistance to *Aplanobacter stewarti* [ibid., xiii, p. 571] has been shown by the early white Vanguard and the late yellow Bantam Evergreen maize varieties.

Phomopsis vexans, the agent of fruit rot of eggplant [ibid., xi, p. 356; xii, p. 395], has been found to penetrate the seed coat and to survive 30 minutes' immersion of the seed in mercuric chloride 1 in 1,000; it is generally destroyed, however, by 30 or 10 minutes' soaking in hot water at 50° or 55° C., respectively.

Root rot of peas (*Aphanomyces*) [*euteiches*: ibid., xiii, p. 3] was successfully combated by the application of commercial fertilizers at the rate of 2,000 lb. or more per acre, the nitrogen constituent being the most active in the reduction of infection. The treatment should not be given until four or five days after sowing the seed in order to avoid direct contact between the latter and the nitrogen carriers, which may otherwise cause severe rotting.

Club root of rape [*Plasmodiophora brassicae*] was sufficiently checked by repeated applications of lime over a lengthy period to give yield increases of 418 and 44 per cent. in 1931 and 1932 (early and late infections), respectively [ibid., xiii, p. 740]. The infection percentages on the heavily limed plots were 18·3 and 8·5 per cent., respectively, in the two years, as compared with 93·2 and 45·7 on the untreated. In 1932 the incidence of the disease was reduced from 75 to 17 per cent. by the application of calcium cyanamide at the rate of 1,200 lb. per acre.

Seed transmission of tomato wilt (*Fusarium*) [*lycopersici* or *bulbigenum* form 1: ibid., xi, p. 355; xiii, p. 194] was demonstrated in three out of six lots of seed from diseased plants, but none of the 2,395 tomato plants raised from seed from plants infected with canker (*Aplanobacter michiganense*) in 1931–2 developed the disease [ibid., x, p. 136 *et passim*].

Satisfactory control of *Phoma betae* was obtained on a commercial scale by 30 minutes' immersion of the seed-clusters in hot water at 55° [cf. ibid., xi, p. 356].

Excellent control of seed decay and damping-off [?*Pythium* spp. and *C. solani*] of eggplant, tomato, pepper [*Capsicum annuum*], spinach, cabbage, cucumber, peas, sweet peas, and in some cases Lima beans [*Phaseolus lunatus*] has been secured with red copper oxide dust [ibid., xiii, p. 644]. Applied at the rate of 1½ oz. per sq. ft. of surface and mixed with the upper 3 in. of soil, 6 per cent. formalin dust was effective in a number of vegetables, while in cucumbers these disorders were well

controlled by soil treatment with calcium cyanamide (1,000 to 2,000 lb. per acre) a week before planting.

A species of *Pestalozzia* was found to be a primary pathogen of the fern *Cibotium schiedei*, causing the death of the frondlets and sometimes of complete fronds.

VAN DER GOOT (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1932.** [Diseases and pests of cultivated plants in the Dutch East Indies in 1932.]—*Meded. Inst. voor Plantenziekten*, 83, 80 pp., 1934.

Among the numerous items of interest in this report, prepared on the usual lines [*R.A.M.*, xiii, p. 686], the following may be mentioned. The incidence of root rot of rice in the Bantam and Pekalongan Residencies of Java showed a decline as compared with the previous year, the chief damage being in the late west monsoon plantings. The cultivation of the resistant Brondol poetih and Chingfow varieties will be encouraged by the phytopathological and local authorities. Appreciable damage was caused by the disease in the Bodjonegoro Residency, involving 13,003 hect. and in Soerabaja (nearly 6,000 hect.).

In one part of the Banjoemas Residency (Java) an infectious bacterial disease finally exterminated the already diminishing coco-nut insect pest, *Brachartona catoxantha*, early in 1932; elsewhere combined bacterial and fungal attacks acted similarly during the west monsoon of 1932–3. A gummosis of coco-nut in Timor, causing sterility and gradual necrosis, appears to be of physiological origin.

In west Borneo *Hevea* rubber was more severely attacked by pink disease (*Corticium salmonicolor*) than in the previous year, the clone BR I being apparently specially susceptible on marshy soils. The West Java Experiment Station reported an outbreak of black root rot caused by *Rosellinia bunodes* on rubber [ibid., ix, p. 129; cf. also xiii, p. 687] in the Bandjar district, involving some 1,000 trees. Mildew (*Oidium heveae*) [ibid., xii, p. 323] was also prevalent, and little or nothing is done at present to combat it either in west or central Java.

Top die-back of coffee [*Rhizoctonia* sp.: ibid., xii, p. 286] was widespread on the west coast of Sumatra, where the Bangelan 105/03 variety shows marked susceptibility. With a view to control, the affected trees are cut down to the stump and two suckers allowed to develop. There was no appreciable extension of the disease in central or eastern Java.

Coryneum myristicae [ibid., xiii, p. 686] was once more responsible for heavy damage to the nutmeg crops in the Atjeh Residency (50 per cent. of inferior produce) and central Java.

The die-back of pepper [*Piper nigrum*] vines [ibid., xii, p. 425] continued to spread in Atjeh. Foot rot (*Phytophthora* sp.) occurred in epidemic form on this crop in west Borneo (Bengkajang subdivision), destroyed 12,000 vines in Paroenkoedjang (Java), and also caused heavy damage in Benkoelen (Sumatra), a disturbing feature of the disease in the latter region being its tendency to progress in an upward direction in sloping gardens. *Corticium salmonicolor* and a *Marasmius* also infected pepper in west Borneo, while in Bangka (Sumatra) chlorosis spread extensively.

The Hybrid No. 3 groundnut variety was attacked by slime disease

[*Bacterium solanacearum*: ibid., vii, p. 307] in five localities of Sumatra, where it was consequently replaced by Schwarz No. 21 from Java.

In the Buitenzorg district of Java mildew (*Oidium*) [*tingitaninum*: ibid., vii, p. 675] was very troublesome on citrus, occurring during flowering or at the inception of fruit setting.

As in previous years, sugar-cane diseases were only of importance in relation to the P.O.J. 2878 variety, which constitutes the bulk of the crop. Yellow spot (*Cercospora kopkei*) developed in the Pasoeroean district of Java later in the season than in 1931 [ibid., xiii, p. 686], no extensive spread being observed before the second half of March and the incidence of infection declining by May. In Cheribon, *Fusarium moniliforme* [*Gibberella moniliformis*: ibid., xiv, p. 84] was found in a virulent form as early as January, both in the leaf and the more serious top infection phases.

Tobacco at the Besoeki Experiment Station was attacked in the seed-beds by *Pythium aphanidermatum* [ibid., xiii, p. 599], which appears, contrary to the situation in the Vorstenland, to be on the increase. Undoubtedly it is frequently confused with *Phytophthora* [*parasitica*] at a certain stage of development. Once the seedlings had reached the transplanting stage they seemed to be immune from infection.

Cabbage in the Fort van der Capellen district and elsewhere on the west coast of Sumatra was damaged by *Bact. campestre* [*Pseudomonas campestris*: ibid., xii, p. 425].

Sonokling [*Pterocarpus indicus*] and mahogany [*Swietenia mahagoni* and *S. macrophylla*: ibid., vi, p. 63] were attacked in Java by *Fomes noxius* [ibid., xiii, p. 726; xiv, p. 81], and *Acacia* by *Rigidoporus microporus* [*F. lignosus*], while a young teak [*Tectona grandis*] planting suffered from *Bact. solanacearum*.

Derris microphylla was infected by *Diplodia* sp. in west and central Java [ibid., x, p. 525], by *Ustulina* sp. in the former, and by *Xylaria* sp. in the latter region.

The so-called 'lepra' disease of patchouli [*Pogostemon comosus*] was again much in evidence in Atjeh [cf. ibid., viii, p. 226], probably owing to the neglect of the plantations by reason of the low market price of the dried leaves.

Lilies in the Priangan Residency of Java were affected by a disorder probably identical with yellow flat [ibid., xi, pp. 97, 244] which led to the virtual cessation of cultivation in the particular centre involved.

A species of *Marasmius* caused sporadic die-back of ramboetan [*Nephelium lappaceum*] branches in the vicinity of Batavia.

MALLAMAIRE (A.). **L'année phytopathologique en Côte-d'Ivoire.** [The year's phytopathology on the Ivory Coast.]—*Agron. Colon.*, xxiii, 202, pp. 114–119, 1934.

During 1933, heavy rains on the lower Ivory Coast greatly favoured the development of *Trachysphaera fructigena* [*R.A.M.*, ii, p. 495] on the 'cherries' [fruit] of Liberian coffee bushes; in one locality comprising 4,500 hect. of coffee, important losses were sustained. Effective control is given by strongly adhesive cupric mixtures at a concentration of 3 per cent.

Marasmius scandens [ibid., xii, p. 207] was prevalent on coffee and

cacao. *Corticium koleroga* [ibid., xiii, pp. 230, 574] was noted for the first time on coffee bushes at Bingerville Agricultural Station.

As a result of planting with suckers from diseased mother plants Chinese banana [*Musa cavendishii*] plantations laid down in 1932 and early in 1933 became affected with *M. stenophyllus* Mont. (*M. semiustus* Mass.) [ibid., xiii, p. 352].

CHEVALIER (A.). **Les Rubiacées à bactéries fixatrices d'azote.** [Rubiaceae with nitrogen-fixing bacteria.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xiv, 156–157, pp. 633–643, 1 pl., 1934.

After a reference to previous records in literature of species of the Rubiaceae with leaves commonly bearing nodules containing nitrogen-fixing bacteria [*R.A.M.*, xiii, p. 219], the author states that he found bacterial pustules in the leaves of numerous species of *Pavetta* preserved at the Museum at Paris, and also not infrequently in collected leaves of certain *Pavetta* species from tropical Africa; similar nodules were also observed by him in the leaves of two species of *Ixora* from west Africa. A brief description is also given of the small leaf depressions to which the name 'domatia' has been given and which the author found in wild coffee (*Coffea arabica* and *C. liberica*); these are considered to be bacterial organs of the same nature as those of *Pavetta*. Some notes are further given on similar formations found in other species of Rubiaceae, including *Psychotria* spp., *Lasianthus* spp., and some epiphytic myrmecophilous plants, and in species of *Ardisia* of the Myrsinaceae.

DUFRÉNOY (J.). **Effets d'un bactériophage sur l'appareil vacuolaire du Bacterium tabacum.** [The effects of a bacteriophage on the vacuolar system of *Bacterium tabacum*.]—*Comptes rendus Soc. de Biol.*, cxvii, 30, pp. 373–374, 1 fig., 1934.

Bacterium tabacum, attacked by a bacteriophage derived from cultures of the same organism at Gembloux [Belgium], showed a swelling, agglutination, or fragmentation of the vacuoles—effects which are considered to bring the action of the bacteriophage (the virulence of which in the present case was enhanced by three passages through bouillon cultures followed by filtration through a Chamberland L^3 candle) into line with that of the plant viruses [cf. *R.A.M.*, xiii, p. 589].

CLARK (G. E. M.). **Evidence suggestive of the existence of a filterable stage of Bacterium tumefaciens.**—Abs. in *Phytopath.*, xxiv, 10, p. 1139, 1934.

A single strain of *Bacterium tumefaciens* was grown in nutrient broth, and cultures aged from 2 to 43 days were passed through a Berkefeld 'N' filter [cf. *R.A.M.*, xii, p. 81]. Five out of eight filtrates yielded the organism in a pathogenic form. Four out of six filtrates from milk cultures also yielded *Bact. tumefaciens* in a pathogenic form. In the first of these series direct inoculation of the filtrate into *Bryophyllum calycinum* gave only one positive result, while in the second no certain positive result was obtained. The outcome of three experiments with filtrates from crushed crown galls was negative. Two originally identical strains, only one of which was pathogenic to *B. calycinum*, gave rise to rough and smooth types of *Bact. tumefaciens* after three months in litmus

milk [ibid., xi, p. 226]. In the pathogenic strain the rough type was the more virulent.

MYERS (J. G.). **Observations on wild Cacao and wild Bananas in British Guiana.**—*Trop. Agriculture*, xi, 10, pp. 263–267, 1934.

In this account of his journey in the Amazon Basin in 1932 [*R.A.M.*, xiii, p. 687], the author states that the complete absence of witches' broom disease [*Marasmius perniciosus*] in the wild cacao he saw in the Kanuku mountains was in marked contrast to the badly diseased condition of the wild cacao he had previously observed on the Coppename river, in the interior of Surinam, with which the Kanuku cacao is obviously identical. Offspring of the Coppename plants are now growing at the Imperial College of Tropical Agriculture in Trinidad, and at Kew, and are of the type which Pittier and others consider to be a distinct species (*Theobroma leiocarpa*).

Notes are also given on wild bananas and plantains which the author found during his journey, including a reference to Sir Robert Schomburgk's statement that during his travels [1835–9] in Guiana he observed on the coast of British Guiana a peculiar disease in *Musa* plantations, which 'starts from the innermost vascular bundles which take on a brownish colour intermixed with a number of black spots'. This is believed to be probably the first reference to Panama disease [*Fusarium oxysporum cubense*] or something very similar [e.g. bacterial wilt (*Bacterium solanacearum*): ibid., xiii, p. 788].

KULKARNI (L. G.). **Correlated inheritance with special reference to disease resistance in spring Wheat.**—*Journ. Amer. Soc. Agron.*, xxvi, 10, pp. 885–893, 1934.

The writer found, in his studies [the results of which are discussed and tabulated] at St. Paul, Minnesota, on the inheritance of reaction to a collection of 23 physiologic forms of stem [black] rust [*Puccinia graminis*] in the F_3 lines of a cross between the highly resistant Hope and the very susceptible Liguleless wheat varieties, that resistance is conferred by a dominant factor, R, carried by the former, and susceptibility (in the presence of R) by an inhibitory factor, I, carried by the latter [cf. *R.A.M.*, xiii, p. 428]. In the F_3 lines of crosses between Ceres and Hope and Ceres and Double Cross (semi-resistant), the Hope type of resistance was found to be differentiated by a single factor pair.

The differences in yield between semi-resistant and resistant wheat plants were found not to be statistically significant. A definite correlation was observed, however, between resistance to rust and plumpness of the seed.

Genotypic variations were observed in 70 out of 192 apparently homozygous hybrid lines tested to determine their type of seedling reaction to forms 21 and 36 of black rust [ibid., xii, pp. 556, 750].

COTTER (R. U.). **White pycnia and aecia of Puccinia graminis.**—*Phytopath.*, xxiv, 10, pp. 1121–1122, 1934.

A brief note is given on a white aecidial mutant of *Puccinia graminis agrostidis* that developed on barberry seedlings at St. Paul, Minnesota, as a result of inoculations which yielded 139 normal yellow and 37 white

pycnidia; a few of the latter gave white aecidia when the nectar of another similar pycnidium was transferred to them. The white aecidia were similar in size to the normal yellow ones but slightly different in shape. The spores were hyaline and the intercalary cells in the chains more conspicuous than those in the yellow ones. The aecidiospores of both white and yellow aecidia germinated normally in barley extract, those of the former group producing hyaline germ-tubes.

STEINER (H.). **Ueber den Einfluss der Saatzeit auf den herbstlichen Befall der Winterungen mit Braunrost (Puccinia triticina Erikss. und Puccinia dispersa Erikss.).** [On the influence of the sowing date on the autumn infection of winter cereals with brown rust (*Puccinia triticina* Erikss. and *Puccinia dispersa* Erikss.).]—*Landw. Jahrb.*, lxxx, 3, pp. 401–415, 6 figs., 1934.

A tabulated account is given of the writer's experiments in two localities of Austria on the influence of the sowing date (between 11th August and 8th November) on the incidence of brown rust (*Puccinia triticina* and *P. dispersa* [*P. secalina*]) in the winter wheat and rye crops, respectively [*R.A.M.*, xiii, p. 752]. The wheat varieties used in the tests were Kadolz and Voralpenbart and the rye Wiener-Wald.

It was found that early sowing, by promoting luxuriant growth and heavy tillering, at the same time favoured extensive rust infection in the autumn, particularly in the case of rye. Late-sown plants, on the other hand, with only a few leaves and no shoots at the critical period for attack, remained virtually free from rust.

LUTHRA (J. C.) & SATTAR (A.). **The loose smut disease of Wheat (vernacular, 'kangiari') and some new methods of its control.**—*Agric. & Live-Stock in India*, iv, 5, pp. 495–504, 2 figs., 1934.

This is a popular version of the authors' recent paper on simplified methods for the control of loose smut (*Ustilago tritici*) of wheat in the Punjab, India [*R.A.M.*, xiv, p. 22].

KRÁMSKÝ (O.). **Dreissig Beizstationen der landwirtschaftlichen Schule in Jicín.** [Thirty disinfecting stations of the Jicín Agricultural College.]—*Ratschläge für Haus, Garten, Feld*, ix, 9, pp. 154–156, 1934.

With a view to extending the practice of cereal seed-grain treatment among farmers in the vicinity of Jicín [Gitschin, Czecho-Slovakia], ex-students of the local Agricultural College were entrusted in 1930 with the establishment of 'disinfecting stations' to be distributed throughout the district. So successful was the propaganda in aid of the work, which included a film demonstration with technical explanations, that by the end of 1931 thirty such stations had been set up with the requisite apparatus and were actively functioning. During 1931–2 the stations used 700 kg. ceresan, corresponding (at a rate of 200 gm. per 100 kg. of seed-grain) to 35 wagon-loads of dusted material, i.e. sufficient to plant some 2,000 hect. It was decided, in the first instance, not to call upon the farmers for financial co-operation, but it is expected that in due course contributions towards the upkeep of the stations will be readily forthcoming.

HALLE (J.). **Bekämpfung der Weizenfusskrankheiten.** [Control of Wheat foot rots.]—*Deutsche Landw. Presse*, lxi, 40, p. 494, 1934.

The writer's observations since 1928 in Pomerania have shown that the main requisite in the preceding crop in reducing the incidence of wheat root rot [*Ophiobolus graminis* and *Fusarium* spp.: *R.A.M.*, xii, pp. 23, 154, 432] is the provision of ample shade, which keeps the soil in a state of healthy tilth. The reason why barley in contrast to oats is such an unsuitable forerunner of wheat is that it affords so little shade; a similar objection applies under certain conditions to annual clover. The first consideration in planting sequence is that wheat shall be preceded by a crop giving sufficient shade to induce 'mellowness' in the soil, by reducing the effects of exposure to the sun and to drying out. Another important point is that timely stirring of the upper soil layers is of great assistance in promoting the requisite equilibrium, and should by no means be abandoned in favour of deep ploughing-under of the stubble.

MÜLLER-KÖGLER (E.). **Die Anfälligkeit der Hauptgetreidearten gegenüber Ophiobolus graminis Sacc.** [The susceptibility of the chief cereal species towards *Ophiobolus graminis* Sacc.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xliv, 10, pp. 481–485, 1934.

In order to determine the comparative reactions of the four chief cereals to the foot rot caused by *Ophiobolus graminis* [see preceding abstract], concerning which conflicting opinions are expressed, the writer conducted an experiment at the Kiel branch of the Biological Institute in the spring of 1934 with Peragis summer wheat, Ackermanns Isaria barley, Petkus summer rye, and v. Lochows yellow oats. The plants were divided into three lots, of which one was grown in a sterile soil-sand (1:3) mixture, the second in sterile compost, and the third in ordinary unsterilized soil. A layer of inoculum was placed in the soil at a depth of 2 cm. below the seed, which was sown on 4th April; the seedlings were removed for examination in two batches, one a month and the other 2½ months after planting.

At the first inspection all the wheat radicles in the soil-sand mixture were completely rotted and the cells choked with mycelium. A similar aspect was presented by the seedlings in compost, whereas those in unsterilized soil were somewhat less heavily infected [cf. *R.A.M.*, xii, p. 684]. The second examination revealed a total disintegration and permeation by the fungus of all but the youngest crown roots in the soil-sand and almost equally severe infection in compost. The haulm bases showed a black discoloration. In the unsterilized soil, on the other hand, the plants were only slightly affected. The course of the disease in barley was similar to the foregoing, but the attack was somewhat less virulent. Only half the rye seedlings examined after one month were attacked, the symptoms in the soil-sand mixture and unsterilized soil being more or less localized, while those in compost were even less conspicuous. After 2½ months the action of the fungus on rye plants in the soil-sand mixture was more apparent, all the radicles being disorganized and full of mycelium and the crown roots infected round the site of inoculation. In compost the effects of the disease were

negligible and in unsterilized soil also they were relatively mild. Oats were even less damaged than rye, the fungus being found after $2\frac{1}{2}$ months only in the dead epidermal and outer cortical cells, except at the actual site of inoculation, where the cortex was penetrated.

One important diagnostic character should be noted in the case of all four cereals, namely, the presence of dark-coloured hyphae on the surface of the roots, in the epidermal cells, in the intercellular spaces of the outer cortex, and (in severe attacks) in the central cylinder. In the cortical cells, on the other hand, and in mild cases also in the central cylinder, only a hyaline, slender mycelium of the fungus is found [ibid., xiii, p. 758].

JOHNSTON (W. H.). **Studies on the dehulling of Barley kernels with sulphuric acid and on the inheritance of reaction to covered smut Ustilago hordei Pers. (K. & S.) infection in crosses between Glabron and Trebi Barleys.**—*Canadian Journ. of Res.*, xi, 4, pp. 458–473, 2 figs., 1934.

Following an introductory note on the importance of covered smut of barley (*Ustilago hordei*) in Canada and a review of the literature on the disease with special reference to environmental factors, physiologic specialization of the fungus, and the effects of dehulling the kernels on infection [*R.A.M.*, iii, p. 330], the writer fully describes and tabulates the results of his dehulling experiments and investigations on the inheritance of reaction to attack in F_3 crosses between the highly resistant Glabron and the moderately susceptible Trebi variety.

It was found that the use of concentrated sulphuric acid in the dehulling tests induced complications rendering the exact analysis of the hybrid reactions impossible. Although the hull showed a high degree of resistance to penetration by the acid, the percentage of emergence of seedlings from the treated seeds fluctuated widely, both in parent and hybrid material. Much of the mortality among the treated seeds arose from previous mechanical injury, while the seedlings were considerably damaged by *Penicillium* spp. Increased virulence of infection by *U. hordei* consequent on hull removal led to extreme distortion of the seedlings and failure to emerge.

The hybrids between Glabron and Trebi when inoculated after dehulling with sulphuric acid generally reflected the reactions of the parents to covered smut, and little evidence was forthcoming of a transgression towards increased susceptibility. Segregation for reaction to the disease was not sufficiently clear-cut to establish the mode of inheritance of this character. A slight correlation was demonstrated between smut reaction and plant height but none between smut reaction and barbing of awns or earliness of heading. Little difficulty should be presented by the development of strains combining earliness, smooth awns, and resistance to *U. hordei*.

JONES (G. H.). **Control of Barley diseases. I. Closed smut.**—*Min. of Agric. Egypt, Tech. & Sci. Service* (*Mycol. Sect.*) *Bull.* 142, 19 pp., 8 pl., 1934.

A search for a suitable method to replace formalin steeping for the control of barley closed smut (*Ustilago hordei*) under Egyptian condi-

tions led to the conclusion, which was supported by large-scale tests on ordinary farms, that from a practical point of view the best substitute consists in sulphur dusting. This was cheap, convenient, and gave over 90 per cent. control in addition to protecting the grain during storage from insect attack. The exact dosage required has yet to be determined; in most of the tests a dosage of 4 per 1,000 by weight was used. The method is at present in use on about 4 per cent. of the barley area in Lower Egypt, where the disease is most severe.

Böning (K.) & Wallner (F.). **Versuche zur Bekämpfung der Netzfleckenkrankheit der Gerste (Helminthosporium teres Sacc.).** [Experiments in the control of net blotch disease of Barley (*Helminthosporium teres* Sacc.).]—*Prakt. Blätter für Pflanzenbau u. Pflanzenschutz*, xii, 7, pp. 219–229, 2 figs., 1934.

Whereas the incidence of barley stripe (*Helminthosporium gramineum*) in Germany shows a general tendency to decline consequent on the widespread practice of seed-grain disinfection, net blotch (*H. teres*) [*R.A.M.*, x, p. 514; xiii, p. 296] appears to be on the increase all over Bavaria and, in fact, throughout the country. Occasionally the losses caused by this disease are very considerable, appreciably exceeding those due to stripe, the secondary spread of the fungus inducing premature defoliation with consequent weakening of the plants through the reduction of assimilatory capacity. Preliminary experiments in the control by seed disinfection of net blotch [the symptoms of which are briefly indicated] indicated that various brands of the standard dusts, ceresan and uspulun [ibid., xiv, p. 20], are likely to prove more effective for this purpose than the comparable liquid preparations, though entirely satisfactory results were in no case obtained, since primary infection was not completely eliminated and the few primarily infected plants served as sources of secondary spread. Observations on the relation between various fertilizing schedules and net blotch showed that the amount of infection is lowest where nitrogen is omitted, though no significant increase follows sparing applications of this element. All things considered, it would seem that the correct amount of nitrogen to maintain the crop in good condition with special reference to net blotch is 25 kg. per hect. The omission of potash and phosphoric acid is inadvisable as experiments showed that the disease was more severe in the unmanured plots than in those receiving these substances.

There appears to be no definite record of the occurrence of *H. sativum* in Germany, but the writers believe this organism to be responsible, not only for a leaf disease resembling the foregoing, but also for a foot rot of barley.

Leukel (R. W.) & Stanton (T. R.). **Effect of seed treatments on yield of Oats.**—*Journ. Amer. Soc. Agron.*, xxvi, 10, pp. 851–857, 1934.

The results [which are discussed and tabulated] of two years' experiments with several varieties of oats in Wisconsin, Illinois, and Iowa showed that no consistent increase of yield was obtained by the treatment of the seed-grain in the absence of smut [*Ustilago avenae* and *U. kolleri*] with various disinfectants.

MUNDKUR (B. B.). **Oat smut in India.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 895–898, 1 pl., 1934.

An examination of herbarium specimens of oat smuts at Pusa showed that most of them, though labelled *Ustilago avenae*, were actually *U. kolleri* [cf. *R.A.M.*, xiii, p. 224]. The former was found at Jagannathpur in 1903 and at Lahore in 1917, but it appears to be less prevalent in India than *U. kolleri*.

MUNDKUR (B. B.) & KHAN (M. A.). **A dry spray method of treating Oat seed against covered smut.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 899–905, 1 pl., 1934.

Oat seed from a crop which the previous year had been heavily infected with *Ustilago kolleri* [see preceding abstract] was treated with concentrated formaldehyde diluted with an equal volume of water at the rate of 1 lb. per 24 maunds [1 maund = about 82 lb.]. In 96 acres sown with the treated seed not one plant subsequently developed infection, although the disease was very severe in the adjoining fields sown with untreated seed. The treatment, which did not impair germination, increased the yield over that of the controls by 20 per cent.

CLAUSEN. **Weissseuche oder Urbarmachungskrankheit.** [White sickness or reclamation disease.]—*Mitt. für die Landw.*, xlix, 42, pp. 919–920, 2 figs., 1934.

A brief, popular note, based largely on Rademacher's observations [*R.A.M.*, x, p. 489], is given on the 'white sickness' or reclamation disease of cereals (chiefly oats) in Schleswig-Holstein. In the dry summer of 1934 the disease was prevalent notwithstanding plentiful manuring; a marked feature of the affected stands was the continuous tendency of the plants to form fresh, green shoots from the haulm nodes, even in the stubble stage; in some cases these new shoots attained a height of 0·50 m. and developed rudimentary panicles. Rademacher's conclusions in respect of the varietal reaction of oats to 'white sickness' were verified by the writer in a small-scale test. It is considered urgently necessary to replace the effective but inconvenient liquid copper sulphate treatment by a dry preparation that can readily be strewn over the field.

STEVENS (N. E.). **Stewart's disease in relation to winter temperatures.**—*Plant Disease Reporter*, xviii, 12, pp. 141–149, 6 figs., 1934. [Mimeographed.]

From a consideration of the 'seasonal indices', i.e., simple summations of mean temperature and total rainfall as used by the United States Weather Bureau, for the four seasons, covering the period from 1901–34, an apparently significant correlation between winter temperatures and the incidence of Stewart's disease of maize (*Aplanobacter stewarti*) [*R.A.M.*, xiv, p. 94] may be deduced. No such correlation can as yet be detected between the total rainfall of any season or the temperature during spring, summer, and autumn. Accepting as a working hypothesis the idea that the disease will usually be absent in the north-eastern United States following a winter with an index (sum of the mean

temperatures of December, January, and February) below 90 and present in destructive amounts succeeding one with an index above 100 [calculated in degrees Fahrenheit], useful information may be gained by the study of a map indicating the normal winter temperature indices of certain maize-growing centres. Normal winter temperature indices above 100 are shown in southern Illinois, Indiana, and three districts of Ohio, at Baltimore (Maryland), Washington D.C., Charlottesville (Virginia), and various more southerly localities. As would be expected, the prevalence of the disease in these regions over a period of years has been such as to eliminate the susceptible varieties of sweet corn from commercial production. On the other hand, the normal winter temperature indices for the northern portions of Illinois, Indiana, Ohio, Pennsylvania, and New York, and all of New England north of Connecticut are close to or well below 80, indicating a degree of rarity of *A. stewarti* sufficient to permit of the cultivation of susceptible varieties. Here again the hypothesis holds good. An intermediate position as regards the winter temperature index is occupied by a zone including Long Island, much of New Jersey and southern Pennsylvania, and the higher parts of Maryland, where experience has shown that severe losses from the disease are exceptional but slight injury is liable to occur in the intervening periods. Data are presented in connexion with the winter temperature indices for 1930–4 fully substantiating the hypothesis herein outlined regarding the correlation between high winter temperatures and severe outbreaks of Stewart's disease.

MITRA (M.) & MEHTA (P. R.). **The effect of hydrogen ion concentration on the growth of Helminthosporium nodulosum B. et C. and H. leucostylum Drech.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 914–920, 1 graph, 1934.

A study of the effect of the P_H value of the medium on the growth of *Helminthosporium nodulosum* and *H. leucostylum*, both isolated from *Eleusine coracana* [*R.A.M.*, xii, p. 426], showed that in bacto-peptone solutions the spores of the former tolerated a P_H range from 3·8 to 10, the optimum for percentage germination and length of germ-tube lying between P_H 6·5 and 6·9; on Richards's solution (as shown by the dry weight) the optimum for *H. nodulosum* was P_H 7·1 and for *H. leucostylum* 6·7.

MCCLEERY (F. C.). **Melanose of Citrus fruits.**—*Agric. Gaz. New South Wales*, xlv, 10, pp. 564–566, 1 pl., 1 fig., 1934.

Citrus melanose (*Phomopsis* [*Diaporthe*] *citri*) was first reported in New South Wales in 1897, and of recent years has become serious on oranges, lemons, and grapefruits in the coastal areas owing to the increasing quantity of dead wood in the citrus orchards as the trees grow older. Experimental evidence demonstrated that under the local conditions spraying should be effected immediately after petal-fall; though a second application one month later improved the results, the first treatment by itself gave satisfactory commercial control even in heavily infected orchards.

The author recommends one application of Bordeaux-oil spray (6–4–80–½) immediately after petal fall, the small fruits being thoroughly

wetted [*R.A.M.*, xiv, p. 96]. Lemons and grapefruits attacked by scab [*Sporotrichum citri*] as well as melanose should be given the earlier spray (just after half the flowers have shed their petals) advised for the former disease, which also gives fair control of melanose. During spraying particular attention should be paid to the fruits on the lower and inside branches, as these are the ones most severely attacked. Pruning alone does not give adequate control, and the removal of the small dead twigs that harbour *P. citri* is too tedious and laborious for commercial practice.

Reichert (I.) & Perlberger (J.). **Xyloporosis, the new Citrus disease (First Report).**—*Rehoboth* (*Palestine*) *Agric. Exper. Stat. Bull.* 12 (*Hadar*, vii, 7–8), 50 pp., 15 figs., 1934.

In 1930 enormous damage was caused in Palestine by a new non-parasitic disease of citrus, 'xyloporosis', first observed in 1928 [*R.A.M.*, x, p. 307], but which has already attacked nearly all the newly planted orchards. Only sweet lime [*Citrus medica* var. *limetta*] is susceptible, generally when budded with Jaffa orange (80 per cent. of the Jaffa oranges are budded on sweet lime in Palestine), but unbudded sweet lime may also be affected, especially underneath the limbs on the trunks of trees whose central stem has been pruned away. It was also found on sweet lime stocks grafted with sour lemon, grapefruit, and mandarin; it passes to the mandarin scion, but not to the sour lemon and grapefruit scions. One three-year-old Jaffa orange grafted on bitter orange [*C. aurantium* var. *bigaradia*] became affected. It is prevalent throughout most of the citrus-growing areas of Palestine and was also found in Syria and Cyprus, where the sweet lime is also used as a stock for oranges. During the last ten years the losses caused by it in Palestine are estimated at over £P1,000,000.

The first stage is characterized by the presence of small, roundish or ovoid depressions on the bark, the wood at these points containing small conoid pits with a brownish, pointed base; on the corresponding parts of the inside of the bark are small pegs, generally with brownish points, which fit into the pits.

In the second stage the depressions coalesce into large patches and bands, those below the union (which becomes covered by a knee-shaped swelling) being particularly noticeable. The wood and the bark near the cambium are dark brown, especially the pits with their corresponding pegs, the former being so numerous that the wood appears almost like a sieve. The bark tends to be a yellowish-brown, while the stem becomes elastic, and may be bent in any direction, the trees being liable to break down under the weight of their fruits. Some of the leaves are abnormally small and bright and often have yellow veins. The trees bloom luxuriantly and bear an abnormally heavy crop.

The third stage begins with a brownish discoloration of parts of the bark, generally extending over one-half of the stem below the union. The discoloured parts turn blackish, split, and flake off, the neighbouring wood developing a dry, dark decay. The leaves are small and yellow, and many of the branches slowly wither until finally the whole tree succumbs, though the roots remain active until the tree dies.

Internally the disease is marked by the growth failure of the annual

rings at the affected points, where cambial growth also ceases and a lesion develops which involves the cambium, phloem, and xylem. Carbohydrates accumulate in the fruit juice; in fruits from normal trees the percentages of soluble solids, sugar content, and reducing sugars were, respectively, 10·2 to 10·5, 5·6 to 6·7, and 3·7 to 3·9, as against 12·2 to 12·7, 7·5 to 8·25, and 5 to 5·5, respectively, for the fruit from affected trees.

The condition occurs in all types of soil, but is less prevalent in clay soils than in the other types. No relationship could be established between the incidence of the disease and manuring, irrigation, or climatic conditions. Prevalence increases with the age of the trees, and the disease is considered to have been present long before it was first recorded. Trees budded on two-year-old stocks are more susceptible than those on three-year-old stocks. Differences in the height of budding within the limits 30 to 60 cm. do not affect the development of the disease, but the condition is least severe on trees budded very low. Trees budded on the north-west are less susceptible than those budded on the south or south-west, and those budded on two or three branches of a stock are less affected than those budded on a single trunk. The origin of the seed had no effect on the disease.

Of the control methods practised, viz. cutting the bark and inarching, the latter appeared to be beneficial to affected trees.

It is concluded that xyloporosis is due to physiological factors the nature of which has not yet been determined.

KLOTZ (L. J.). **The use of nitrogen trichloride and other gases as fungicides.**—Abs. in *Phytopath.*, xxiv, 10, p. 1141, 1934.

Nitrogen trichloride gas at concentrations of only 4 to 6 mg. per cu. ft. was found to be lethal to heavy conidial plantings of *Penicillium digitatum* and *P. italicum* on filter paper and agar, and may well prove very valuable in the protection of citrus fruits from decay in storage rooms and transport [*R.A.M.*, xii, p. 615].

FAWCETT (H. S.) & WEINDLING (R.). **Types of Trichoderma rot of Lemons and Oranges.**—Abs. in *Phytopath.*, xxiv, 10, p. 1144, 1934.

In inoculation experiments [in California] on wounded mature lemons with 30 cultures of *Trichoderma* [see below, p. 188], the typical *Trichoderma* rot described by Fawcett and Lee in 'Citrus Diseases and their Control' [pp. 358, 364, 402] was consistently produced by *T. lignorum* [*R.A.M.*, xiii, p. 775] cultures with an odour resembling that of coconut. On the other hand, the non-odorous type forming a yellow pigment failed to cause the ordinary rot, though it sometimes invaded the core of the fruit several weeks after inoculation, inducing internal decay and finally breaking out on the rind. A third strain of the fungus, non-odorous and non-pigmented, caused yet another form of rotting, characterized by a lower infection percentage and firmer appearance than the typical *Trichoderma* decay, and by very slow development. Similar results on a smaller scale were obtained with the three forms of *T. lignorum* on Valencia oranges.

Some monospore cultures from an odorous isolation of the fungus

grew very slowly, gave off only a faint smell, and were non-pathogenic to lemons.

A culture of *T. koningi* [ibid., xi, p. 325 *et passim*] caused a fairly soft, buff-brown rot.

MAYNE (W. W.). **Annual Report of the Coffee Scientific Officer, 1933–1934.**—*Mysore Coffee Exper. Stat. Bull.* 12, 24 pp., 1934.

Further spraying trials conducted in southern India against coffee diseases [chiefly *Hemileia vastatrix*, *Corticium koleroga*, and die-back] confirmed the superiority of casein Bordeaux mixture over linseed oil Bordeaux and other fungicides [*R.A.M.*, xiii, pp. 229, 695]. The plants which received one spray application only, in May, showed leaf counts per measured unit [ibid., xi, p. 41] of 2·65 and 2·76 at the end of the February following, as against 3·83 and 3·31 for those sprayed in May and September.

Continued investigations into coffee black bean confirmed the results previously obtained [ibid., xiii, p. 229] and again indicated that the condition is not of parasitic origin. Examination of spotted beans, large numbers of which were present in the 1933 crop, led to the conclusion that the spotting, which is confined to the endosperm, was of the same nature as black bean. Usually the spots are situated on the outer surface, but sometimes a second spot is present on the inner fold of the bean immediately beneath the outer spot. In relatively small spots the brown disorganized tissues appear as a mass of material forcing its way between the normal endosperm cells, which, however, are so arranged with respect to the disorganized tissue that they were evidently formed after a focus of activity had arisen in the place occupied by the latter; this enables the time of origin of the trouble to be ascertained. The spotting was not due to any organism, and is considered to be most probably a nutritive abnormality.

HARLAND (S. C.). **The work of the St. Vincent Cotton Station.**—*Empire Cotton Growing Review*, xi, 4, pp. 300–309, 1934.

After mentioning that in St. Vincent the annual rainfall amounts to over 100 in., the author states that in 1915 the low cotton yield in the island was due mainly to internal boll disease [*Nematospora* spp.] and angular leaf spot [*Bacterium malvacearum*: *R.A.M.*, xiii, p. 369]. Work on the selection of pure lines resistant to the latter was begun by selecting lines subject to attack latest in the season, and two very resistant lines, AB and AN, were obtained. Resistance does not depend on one or two genes, but probably on a complex of tiny genes which together produce a cumulative effect.

The cutting down of the wild food plants of the cotton stainer [*Dysdercus delauneyi*] immediately reduced the incidence of internal boll disease, the percentage of stained cotton falling from 25 per cent. in 1916–17 to 14·5 per cent. the following year; in 1922–3 the figure dropped to between 5 and 6 per cent. More recent work has led to the development of hybrid strains between Peruvian (*Gossypium barbadense*) and Sea Island cotton with promising results as regards resistance to angular leaf spot [loc. cit.].

BAILEY (M. A.). **Leaf curl disease of Cotton in the Sudan.**—*Empire Cotton Growing Review*, xi, 4, pp. 280–288, 1934.

Cotton leaf curl [*R.A.M.*, xiii, p. 696], first observed in the Gezira (Sudan) in 1923–4, by 1930 attacked almost every plant in the whole area of some 200,000 acres.

Leaf curl symptoms were recently reported by R. E. Massey to have been found on Malvaceous weeds in the Nuba Mountains district in circumstances which did not suggest that infection had spread from cotton, so that it is possible that cotton has become infected from some similar indigenous source.

In 1931–2 the early rains were very light and leaf curl incidence dropped considerably, but in the following season, when the early rainfall was heavier than usual, widespread and severe attacks again supervened. A high percentage of the old cotton stumps of the previous crop survived, and were sprouting vigorously and thus carrying over infection when the new crop was in the ground. In 1933–4 the amount of this ratoon cotton was reduced enormously by the use of the uprooting tool designed by Massey [loc. cit.]. The disease spread slowly after its first appearance, diffusion being due, apparently, to local secondary infection from the parts of the new crop first infected rather than to further infection from outside sources; though wide areas were subsequently affected, the attack set in so late that it did relatively little damage since bolls that have been formed prior to infection appear to be uninjured. The Asiatic varieties remained almost completely immune, while the American ones showed moderate resistance.

Individual plant selection was carried out within the Sakel crop, among pedigree families of Sea Island cotton growing at Shambat, and among the progenies of earlier crosses between Sakel and Sea Island strains. In 1928–9 seed was collected from 170 separate plants, the progenies of which, however, showed little resistance. Some of the hybrids between Sea Island strains and Sakel produced the severest cases of leaf curl yet seen, whereas others were much more resistant than Sakel. Two plants from the progeny of a selection from ordinary Sakel cotton showed considerable resistance and gave two strains, X1530 and X1730, in which the relative immunity of the original sub-selections has been retained; in a small field trial the former showed 6 and the latter 8 per cent. infection, as against 44 and 74 per cent. for the Sakel control plots surrounding them. When the new strains were grown in plots remote from the susceptible controls, X1530, X1730, and X1030 showed, respectively, 3, 2, and 2 per cent. infection, as against 91·5 per cent. in the Sakel plots. In lint characters the first two of these strains agree closely with their Sakel prototype, but are outstanding in vigour and productiveness.

MCNAMARA (H. C.), WESTER (R. E.), & GUNN (K. C.). **Persistent strands of the Cotton root-rot fungus in Texas.**—*Journ. Agric. Res.*, xlix, 6, pp. 531–538, 6 pl., 1934.

This is the full report of the authors' discovery and study at Greenville, Texas, of the occurrence in the cotton root rot fungus (*Phymatotrichum omnivorum*) of persistent strands, a comprehensive summary

of which has already been noticed from another source [*R.A.M.*, xii, p. 628].

NEAL (D. C.), WESTER (R. E.), & GUNN (K. C.). **Morphology and life history of the Cotton root-rot fungus in Texas.**—*Journ. Agric. Res.*, xlix, 6, pp. 539–548, 11 pl., 1 fig., 1934.

A detailed account is given of the authors' study of the morphology of the *Ozonium* and sclerotial stages of *Phymatotrichum omnivorum*, and also of the life-history of the fungus under field conditions in Texas. A special comparative study was made of the structure of persistent strands [see preceding abstract] and of the sclerotia at various stages of their development, the results of which showed that while the central portion of some of the strands is well defined, comprising from one to three large, septate hyphae, other strands are entirely cellular and closely resemble true sclerotia in their structure. The histological study of mature and newly formed sclerotia obtained both from laboratory cultures and from the soil largely confirmed the work of previous authors.

The importance of the persistent strands in the overwintering and perpetuation of *P. omnivorum* in the soil of infected fields was clearly demonstrated by the fact that many of the strands collected from fallow plots, from fields planted to non-susceptible crops, and from soil cultures were found to be viable after long intervals of time, and special inoculation experiments showed such strands to be infective to susceptible hosts.

GHESQUIÈRE (J.). **Un entomophyte nouveau de la mouche blanche des serres.** [A new entomophyte on greenhouse whitefly.]—*Bull. Soc. Roy. Bot. de Belg.*, lxvii (Sér. II, xvii), 1, p. 96, 1934.

The author observed larvae and nymphs of the greenhouse whitefly (*Trialeurodes vaporarium*) in the tropical hothouses of the Botanical Gardens, Brussels, parasitized by *Torrubiella luteorostrata* [*R.A.M.*, iii, p. 212], stated to be the first European record of this species. The fungus is characterized by red, flask-shaped perithecia on a purple subiculum surrounded by a fine, white mycelial fringe.

HENDEE (ESTHER C.). **The rôle of fungi in the diet of termites.**—*Science*, N.S., lxxx, 2075, p. 316, 1934.

Termites (*Zootermopsis angusticollis*) fed on rotten, fungus-containing Monterey pine [*Pinus radiata* = *P. insignis*] and Douglas fir [*Pseudotsuga taxifolia*] wood in California made much more vigorous growth than those on a sound, fungus-free substratum of the same trees [*R.A.M.*, xiii, p. 509]. Moderately good growth was also made by the termites on Douglas fir superficially infected by *Trichoderma lignorum* and on Monterey pine bearing fungi introduced by the insects themselves. It is as yet uncertain whether the improved growth of the termites, which was clearly associated with the presence of fungi, was due to the superior nutritional qualities of the infected wood (fungi being a source of proteins), to the neutralization by the fungi of some toxic factor in the substratum, or to both conditions.

Trotter (A.). **Il fungo-Ambrosia delle gallerie di un Xyleborino di Ceylon.** [The Ambrosia fungus of the galleries of a *Xyleborus* from Ceylon.]—*Ann. R. Ist. Sup. Agrar. di Portici*, Ser. III, vi, pp. 256–275, 6 figs., 1934.

In the galleries of a *Xyleborus* in the branches of living *Brownea grandiceps* sent to Italy from Ceylon the author observed two superimposed fungal layers. The lower one consisted of short chains of the subolivaceous, sterile, torulose, subglobose hyphae of an 'Ambrosia' type [cf. *R.A.M.*, xiii, p. 440] 8 to 12 μ in diameter, composed of two to four conidium-shaped segments (of which the terminal one was the thickest) forming a compact layer of chaplets. The upper layer consisted of a whitish mass of hyaline, variously shaped, continuous conidia ranging from 8 by 4 to 35 by 7·5 μ, or even larger; in this stage the fungus resembled morphologically a *Monilia*, though the elongated, subclavate, somewhat falcate conidia suggested affinity with the genus *Cylindrium* and the presence of a basal layer recalled *Cylindrocolla*, *Blennaria*, *Sirodochiella*, &c.

In hanging drop cultures at 21° C. the conidia germinated freely in six hours with the production of hyaline, non-septate germ-tubes producing a few moderately long branches at right angles. Prior to, or during, germination the conidia ordinarily became septate and turned yellow, only the smallest remaining continuous, while the others formed one to three slightly constricted septa and assumed a chlorine tinge. In this stage the organism had affinities with the genera *Septocylindrium*, *Fusoma*, &c., if considered as belonging to the Moniliaceae, or with *Discocolla* or *Fusarium* if regarded as one of the Tuberculariaceae. By reason of the olivaceous mycelium, the chaplets of olivaceous hyphae, and the chlorine tinge of the conidia it had some of the characters of the Dematiaceae.

When grown in pure culture new conidia were produced of the type observed in nature and, on the same mycelium, short branches with microconidia and also irregular, thickened, torulose hyphae sometimes in short chains, exactly resembling those of the Ambrosia in the galleries except that they were pale chlorine or subhyaline.

The author considers that the fungus belongs to an undescribed genus and names it *Ambrosiaemyces zeylanicus* n. gen., n. sp. with Latin diagnoses.

It is concluded that the same fungus in its conidial stage, or another species of the same genus, is probably present on European material. In the Ceylon material the conidia can disseminate the fungus during the emergence of the insect and reproduce the Ambrosia stage directly. Adult insects in boring new galleries act as vectors. The catenulate, conidium-shaped hyphae resemble those of certain Endomycetaceae from which, however, the fungus differs, as it does from all the other Gymnoascales, in its non-septate mycelium and the absence of asci.

Nannizzi (A.). **Repertorio sistematico dei miceti dell'uomo e degli animali.** [A systematic repertory of human and animal fungi.]—*Trattato di Micopatologia Umana*, iv, xii+557 pp., 224 figs., Siena, S. A. Poligrafica Meini, 1934.

In this well-produced and valuable work of reference the author gives

a list, arranged in the order of their systematic position, of all the species of fungi, together with their synonyms and including the Actinomycetales, isolated clinically from human and animal diseases which he has been able to trace up to the end of 1932, as well as some recorded in the early part of 1933. A short description is given of the characters of each fungus in culture and of those of most of them *in situ*, classification being further facilitated by the illustrations and analytical keys. A bibliography of works of a general nature is included and there is an index of the genera and species mentioned.

This book is the fourth volume of the complete treatise which is to be published under the general editorship of Professor Pollacci, but in view of the fact that an up-to-date work of this nature has long been urgently needed, it has been issued before volumes I to III.

CATANEI (A.). **Recherches parasitologiques et expérimentales sur la sporotrichose, les blastomycoses et l'actinomycose, en Algérie.** [Parasitological and experimental researches on sporotrichosis, blastomycoses, and actinomycosis in Algeria.]—*Arch. Inst. Pasteur d'Algérie*, xii, 3, pp. 351–366, 1 pl., 3 figs., 1934.

Full details are given of the writer's studies in Algeria on the morphological, cultural, and pathogenic aspects of *Sporotrichum beurmanni* [*R.A.M.*, xiii, p. 770], isolated from the human leg; *S. biparasiticum* Bubák, 1906, from water [ibid., viii, p. 783]; the fungus isolated from blastomycotic lesions in the forearm, originally described as *Cryptococcus montpellieri* Cat. [ibid., xii, p. 288] but here transferred to *Candida* (*C. montpellieri*) in Langeron's and Talice's classification [ibid., xiii, p. 767; xiv, p. 101]; *Hormodendron algeriensis* n. sp., isolated from the leg and characterized by brown, septate, branched hyphae, averaging 4 μ in diameter; erect, pluriarticulate conidiophores bearing concatenate, ovoid or elongated conidia, 5·5 to 11 by 3 to 4 μ; forming dark green to blackish-brown colonies on Sabouraud's agar and carrot; and growing best at 37° C.; and three strains of *Cohnistreptothrix* [*Actinomyces*] *israeli*. *S. biparasiticum* proved to be virulently pathogenic to animals, while *Candida montpellieri* and *H. algeriensis* gave positive results on rabbits inoculated subcutaneously.

ROTTER (W.) & CHAVARRIA (A. P.). **Weitere Untersuchungen über Blastomykosen in Costa Rica.** [Further studies on blastomycoses in Costa Rica.]—*Arch. für Schiffs. u. Tropenhyg.*, xxxviii, 10, pp. 406–417, 11 figs., 1934.

From extensive, verrucose, partially cicatrized lesions on the arm and hand of a Costa Rican agricultural labourer affected by chromoblastomycosis the writers isolated a fungus with a thick, septate mycelium and conidiophores bearing spherical conidia. On serum round, yellow bodies developed in three weeks, identical with those found in the tissues. The organism was identified by Dr. Dodge of St. Louis as *Hormodendrum langeroni* Fonseca, Area Leão, and Penido [*R.A.M.*, x, p. 523]; it was only mildly pathogenic to laboratory animals.

Clinically, anatomically, and mycologically the fungus isolated from

a case of coccidioidal granuloma (believed to be the first in Central America) in a negro corresponded with *Paracoccidioides brasiliensis* [ibid., xiii, p. 579], the slow growth of which (25 days elapsed before the colonies were visible to the naked eye on Sabouraud's medium) differentiates it from *Coccidioides immitis* [ibid., xiv, p. 101]. In agreement with Almeida's observations, cysts were detected in various states—dividing, proliferating, and surrounded by a circle of small, round bodies.

The fungus isolated from a frontal lesion in a farm labourer was tentatively identified by Dr. Dodge as *Hemispora stellata* [ibid., xiii, p. 701]. It forms numerous biscuit-shaped, yeast-like bodies in culture. *Aspergillus unguis* Weill & Gaudin was considered by the same authority to be the agent of a case of onychomycosis. Other fungi implicated in the dermatomycoses of Costa Rica include *Sporotrichum*, *Microsporon* [*Malassezia*] *furfur*, *Achorion schoenleini*, *Trichophyton tonsurans*, *Microsporon felineum*, and *Gliocladium* sp.

McDonald (Cornelia). **A study of Coccidioides immitis.**—*Journ. Lab. & Clin. Med.*, xx, 1, pp. 47–53, 7 figs., 1934.

From the network of hyphae and spores obtained from a pharyngeal lesion in a male patient from Louisiana, suffering from coccidioidal granuloma (*Coccidioides immitis*) [see preceding abstract], raised white or occasional brown colonies developed on agar plates; they consisted of small, spore-like, Gram-positive, non-acid- and alcohol-fast bodies and branched, septate, vacuolate hyphae. Rapid and abundant growth was made on carbohydrate media, without acid or gas formation. Transferred to agar slants the aerial hyphae rapidly formed a cloudy, white growth. Culturally and microscopically the fungus showed all the characters first described in detail by Wolbach (*Journ. Med. Res.*, viii, p. 53, 1904). Conidia, usually abstricted from the hyphal tip, were observed in the older cultures, and chlamydospores as described by Ophüls (*Journ. Exper. Med.*, vi, p. 443, 1905) were found occasionally within the hyphae and bore a marked resemblance to the spherical bodies recovered from the sputum and detected in animal tissue.

The conversion of spherical bodies as found in the pus of the lesions into mycelium was studied in hanging drops, and the development from the former of a network of branched, septate hyphae, which became clubbed with advancing age and produced spores, was followed.

Brunetto (Stefania), Ciferri (R.), & Redaelli (P.). **Caratteri e posizione sistematica del genere Redaellia Cif.** [The characters and systematic position of the genus *Redaellia* Cif.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, v, pp. 125–143, 8 figs., 1934. [Latin and English summaries.]

A detailed study of the cultural and morphological characters of *Redaellia elegans* Cif. (the only species of this genus) showed that on solid media the fungus formed yellowish-white, glabrous, frequently cerebriform colonies, the larger ones resembling those of *Trichophyton*, while in Raulin's liquid numerous, minute, glabrous, arborescent, yellowish colonies formed at the bottom of the tube, where, in peptonized

water a compact, glabrous, honey-yellow layer developed. The hyphae ranged from 5 to 12 μ in diameter, and the spherical chlamydospores had a distinct double wall, were borne singly or in chains, and measured 7 to 30 μ in diameter. The conidia developed as true acrogenous, verticillate thallo-blastospores borne in short chains on small digitate processes arising from the swollen apex of the sporiferous hyphae, which were only formed under semi-anaerobic conditions.

The presence of the last-named organs shows that *R. elegans* is one of the more highly organized Mycotoruleae, though remote from other genera in the same sub-family. It approaches *Trichosporon* Vuillemin (or *Trichosporum* Behrend), the colonies of some species of which, such as *Parendomyces rugosus* (Cast.) Ota (=*Hemispora rugosa* or *T. rugosum*) [*R.A.M.*, v, p. 363] very closely resemble those of *R. elegans*.

This connexion between *Redaellia* and the group *Parendomyces-Trichosporon* is confirmed by the fact that the genus *Geotrichoides* was transferred by Ota and Kawatsuré to *Trichosporon* [ibid., xiii, p. 235]. More recently, Verona identified *Geotrichoides* with *Proteomyces* Moses et Vianna, which Ciferri placed among the Mycotoruleae. It is not, however, possible to refer *Redaellia* to the group *Proteomyces-Geotrichoides-Trichosporon-Parendomyces* owing to the peculiar formation of the blastospores and the absence of definite arthrospores in *Redaellia*.

In the light of the available information the genus *Redaellia* should be included in the Torulopsidaceae-Mycotoruleae, among the more highly organized genera forming a transition group between the Blastosporales and the Arthrosporales. A more definite identification is not possible until more is known of the fungi comprising the group *Parendomyces-Trichosporon*.

Inoculations of laboratory animals showed that under the experimental conditions *R. elegans* was only very weakly pathogenic.

Leão (A. E. de A.) & Lobo (J.). **Mycétome du pied à Cephalosporium recifei n. sp. Mycétome à grains blancs.** [A mycetoma of the foot due to *Cephalosporium recifei* n. sp. A mycetoma with white grains.] —*Comptes rendus Soc. de Biol.*, cxvii, 29, pp. 203–205, 1934.

Cephalosporium recifei n. sp., isolated from a mycetoma of the foot with yellowish-white grains in a Brazilian farmer, is characterized by white to canary-yellow colonies, septate hyphae, 2·5 μ in width, and erect conidiophores, 24 to 32 μ long, bearing at their apex smooth, hyaline, elliptical conidia, 2 μ in diameter. Gelatine is liquefied and milk coagulated. The optimum temperature for growth is 25° to 30° C.

Allen (Ruth F.). **Heterothallism in Flax rust.**—Abs. in *Phytopath.*, xxiv, 10, p. 1143, 1934.

When the spermatia of one sex of the heterothallic flax rust (*Melampsora lini*) [*R.A.M.*, xii, p. 632] are transferred to the surface of an infection of the opposite sex, they enter the leaf through epidermal cells or through spermogonia, and after a short period of growth in the leaf tissue pair with the hyphae in the aecidia to form the basal cells from which the aecidiospores arise.

Severin (H. H. P.) & Freitag (J. H.). **Ornamental flowering plants naturally infected with curly-top and Aster-yellows viruses.**—*Hilgardia*, viii, 8, pp. 233–262, 3 pl., 17 figs., 1934.

This paper on ornamental flowering plants naturally infected with curly top and aster yellows in California is an expanded version of one already noticed from another source [*R.A.M.*, xii, p. 446]. *Dianthus barbatus* is now omitted from the list of hosts harbouring the former disease, while *D. plumarius* and *Viola cornuta* are added to it. To the plants from which yellows was transferred to asters and celery by the leafhopper *Cicadula divisa* Uhl. [*C. sexnotata*] the following are now added: *Eschscholtzia californica* (Papaveraceae), *Godetia grandiflora* (Onagraceae), and, among the Compositae, *Tagetes erecta*.

Severin (H. H. P.). **Weed host range and overwintering of curly-top virus.**—*Hilgardia*, viii, 8, pp. 263–280, 2 pl., 8 figs., 1934.

Fifty-seven species of weeds in 28 genera belonging to 16 families growing in cultivated and uncultivated parts of California were experimentally infected with curly top [see preceding abstract]. Naturally infected wild plants growing in uncultivated localities included 14 species in 13 genera belonging to 8 families. In the cultivated areas 26 species of weeds in 15 genera belonging to 9 families were naturally infected. The virus overwintered in 11 species of annual and 3 species of perennial wild plants in the uncultivated districts, while in the cultivated areas 4 species of perennial weeds and 3 species of weeds sometimes annual and sometimes perennial were naturally infected. Lists of all these plants are given. The economic plants which may enable the virus to overwinter and which were found to be naturally infected included lucerne, parsley, and potato. The virus seldom overwinters in male beet leafhoppers [*Eutettix tenella*], most of which die during the winter; the infective power is not retained during the adult life of the females unless they reinfect themselves during the winter.

White (R. P.). **The effect of mosaic on bloom production of the Talisman Rose.**—*Phytopath.*, xxiv, 10, pp. 1124–1125, 1934.

During the two years' experiments under controlled conditions at the New Jersey Agricultural Experiment Station, 28 mosaic-free Talisman roses annually produced a total of 31·98 blooms per plant, with an average stem length of 10·77 in., the corresponding figures for diseased plants being 34·78 and 10·55 in., respectively [*R.A.M.*, xi, p. 374]. The percentages of imperfect blooms cut from healthy and diseased plants were 2·90 and 7·65, respectively. Expressed on a basis of the annual production of saleable blooms per plant, the healthy plants yielded 31·05 and the diseased 29·07, these figures denoting that the practical effect of the disease on the Talisman variety is very slight in contrast to the susceptible Madame Butterfly, the production of which may be reduced to less than a quarter of the normal.

Jenkins (Anna E.). **Cryptosporium canker of Rose.**—*Plant Disease Reporter*, xviii, 12, p. 157, 1934. [Mimeographed.]

Cryptosporium minimum [*R.A.M.*, xii, p. 447] has recently been identified on rose stem cankers in Oregon and Pennsylvania, apparently

the first records of the occurrence of the fungus in the United States. On the Oregon material, consisting of old stems apparently weakened by the effects of abnormally low temperatures in the previous winter, cankers due to *Coryneum microstictum* [ibid., xiii, p. 288] were also present. The *Cryptosporium* cankers on the rose in Germany are described by Laubert (who verified the American identifications) in *Centralbl. für Bakt.*, Ab. 2, xix, p. 163, 1907, as ranging from ¼ to 1½ cm. in diameter, at first black with purple borders, becoming lighter, and bearing white spore masses.

WALTER (MARTA). **Eine gefährliche Asternkrankheit.** [A dangerous Aster disease.]—*Ratschläge für Haus, Garten, Feld*, ix, 10, pp. 173–174, 1 fig., 1934.

A popular note is given on the *Fusarium* wilt of asters [*Callistephus chinensis*: *R.A.M.*, xiii, p. 704] in the Munich district, with directions for its control by appropriate cultural measures and seed and soil disinfection with 0·1 per cent. ceresan. The disease occurs through a temperature range of 4° to 32° C., reaching a climax round about 12°.

WHITE (H. E.). **Preliminary report on breeding rust resistant Snapdragons.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 589–590, 1934.

In breeding tests carried out in Massachusetts to develop snapdragon [*Antirrhinum majus*] strains resistant to rust [*Puccinia antirrhini*: *R.A.M.*, xiv, p. 12] it was found that the very resistant strains were commercially undesirable, producing irregularly shaped flower spikes with magenta flowers. An original resistant (magenta) strain was then crossed with commercial varieties, and this resulted in a segregation of colours in the ratio of two magenta (i.e., true magenta and all combinations with red) to one white (ivory) or yellow; selfed white or yellow plants segregated true for colour type in the F_1 and F_2 generations. White (ivory) was dominant over yellow. Inheritance of rust resistance in these crosses appeared also to be dominant. Segregation for rust reaction in the yellow- and ivory-flowered plants was three resistant to one susceptible. The homozygous individuals bred true for colour and resistance, while the heterozygous types segregated again into a 3:1 ratio. Resistance tended to stay with white and yellow, indicating a possible connexion between resistance and colour, a view supported by the fact that when pink, bronze, or red varieties were crossed with the original resistant magenta strain the resultant progeny were more susceptible than crosses with white or yellow varieties; further, selections for resistant pink strains were very difficult to obtain. Commercial varieties when crossed with each other were completely susceptible. Selected resistant strains withstood direct inoculations with rust.

TOMPKINS (C. M.). **Breaking in Stock (Matthiola incana), a virosis.**—Abs. in *Phytopath.*, xxiv, 10, p. 1137, 1934.

Annual stock (*Matthiola incana*) in the coastal areas of central California is subject to a systemic virus disease characterized by stunting of the plants and sectorial or complete 'breaking' of the flowers in the terminal racemes [cf. *R.A.M.*, xiii, p. 446], resulting in a bleached, blotched appearance of the undersized petals; there was also occasional

leaf mottling, and a reduction in the size of the seed pods. All varieties and colours seem to be susceptible to natural infection, especially American Beauty and Heatham Beauty in the Giant Imperial and Giant Perfection groups. Broken flowers are commercially valueless. Young, healthy Imperial Crimson seedlings were successfully infected to the extent of 60 per cent. by juice inoculations in the greenhouse at about 60° F., the incubation period ranging from five to seven weeks. The relation of this disease to a destructive cauliflower virus [see below, p. 207] and its mode of spread in the field remain to be determined.

GREEN (D. E.). **A leaf spot of Daphne mezereum new to Great Britain.** —*Gard. Chron.*, xcvi, 2496, p. 305, 2 figs. (1 on p. 304), 1934.

Daphne mezereum leaves examined by the writer in 1934 were found to bear raised, circular, light brown, necrotic spots, about 1 mm. across, produced by *Marssonina daphnes* [*R.A.M.*, xi, p. 109]. Defoliation results from spots developed in the narrow basal portion of the leaf. The waxy acervuli are formed below the epidermis which is ruptured to liberate hyaline, unequally bicellular, slightly falcate conidia, measuring 20 by 6 μ, which are disseminated by wind and rain. This is believed to be the first record of the fungus in Great Britain.

WHITE (R. P.). **Mercury ammonium silicate as a Gladiolus corm treatment.**—*Phytopath.*, xxiv, 10, pp. 1122–1124, 1934.

The writer tabulates and briefly discusses the results of tests at the New Jersey Agricultural Experiment Station on the efficacy of a mercury ammonium silicate dip (prepared by the action of a mercuric chloride solution on a mixture of ammonium hydroxide and sodium silicate) compared with the standard calomel [mercurous chloride] dip and seven hours' immersion in 1 in 1,000 mercuric chloride for the control of gladiolus scab [*Bacterium marginatum*: *R.A.M.*, xiii, p. 168] and *Penicillium gladioli* [ibid., x, p. 645]. Very encouraging results were given by the mercury ammonium silicate gel with a mercury concentration equal to that in the standard calomel formula, especially in 1933, when the compound was used in a less soluble form than in 1932. Applied at one-half the standard mercury concentration, the efficacy of the mercury ammonium silicate gel was markedly reduced in 1932 but not appreciably impaired in 1933.

The percentage of corms free from infection by *P. gladioli* was increased in 1932 from 18·9 to 49·7 and in 1933 from 43·4 to 69·7, these figures being much more satisfactory than those obtained with calomel in 1931.

KAVEN (G.). **Krankheiten und Schädlinge an Rhododendren.** [*Rhododendron* diseases and pests.]—*Die Kranke Pflanze*, xi, 10, pp. 123–126, 1934.

The 'collapse' of young rhododendrons associated with infection by *Phytophthora cactorum* [*R.A.M.*, xii, p. 696] in Germany is stated to be preventable by immersion in a 0·25 per cent. uspulun solution. More serious are the leaf spots of older plants caused by species of *Phoma*, *Gloeosporium*, *Pleospora*, *Phacidium*, and *Pestalozzia* [ibid., xi, p. 650], which are not only disfiguring but induce premature defoliation. All

these organisms may be controlled by thorough sanitation coupled with the application of a standard fungicide, e.g., Burgundy mixture or ammoniacal copper carbonate (0·5 to 2 per cent.). Similar measures may be used against *Phyllosticta cunninghami* and *Diplodia rhododendri* [ibid., x, p. 798], the sole external signs of which are their minute fructifications on the leaves. *Chrysomyxa rhododendri*, the alternate stage of which is formed on spruce [*Picea excelsa*: ibid., xiii, p. 201], can persist in the absence of the latter under greenhouse conditions. *Exobasidium rhododendri* [*E. vaccinii*: ibid., xii, pp. 399, 696] produces white or reddish-tinted galls on leaves and shoot tips. Destruction of diseased material is indicated in the two last-named cases.

Brown (Nellie A.). **A fungus gall on Viburnum mistaken for crown gall.**—*Phytopath.*, xxiv, 10, pp. 1119–1120, 1 fig., 1934.

The writer has had under observation at intervals since 1923 a disease resembling crown gall (*Bacterium tumefaciens*) on *Viburnum opulus* from a public park in New York State. Galls measuring ¼ to 1 in. or more in diameter occurred at or near the nodes of the stem, which was usually encircled. The bacterium could not be isolated from the diseased material which, however, yielded a *Phomopsis* shown in 1934, as a result of positive inoculation experiments on *V. tomentosum*, to be the cause of the disease. Since the organism enters the host through wounds, it seems probable that a mite or aphid may assist in the process of gall formation.

Yarwood (C. E.). **Effect of mildew and rust infection on dry weight and respiration of excised Clover leaflets.**—*Journ. Agric. Res.*, xlix, 6, pp. 549–558, 1 fig., 3 graphs, 1934.

Under the experimental conditions fully described in this paper, infection of excised red clover (*Trifolium pratense*) leaflets floated on sucrose nutrient solutions with mildew (*Erysiphe polygoni*) was shown to cause an average decrease of 9 per cent. in the dry weight of the leaflets during a 12-day period, while infection with rust (*Uromyces fallens*) caused an average increase of 10 per cent. [cf. *R.A.M.*, xiii, p. 773]. During a 9- to 11-day period after inoculation, the respiration of the leaflets was increased by an average of 41 per cent. by the mildew and of 123 per cent. by the rust. The rate of respiration of rust-infected leaflets was greater in aerated culture flasks than in flasks in which the respiratory gases were allowed to accumulate, and dusting the leaflets with sulphur increased the respiration of both healthy and mildew-infected leaflets.

A brief discussion is given of the influence which may be exerted on the changes in dry weight of the leaflets by the differences in the extent of invasion of the leaf tissues by the mildew and rust fungi, respectively.

Brink (R. A.), Jones (F. R.), & Albrecht (H. R.). **Genetics of resistance to bacterial wilt in Alfalfa.**—*Journ. Agric. Res.*, xlix, 7, pp. 635–642, 2 graphs, 1934.

The results of preliminary studies in 1933, some of which have been noticed from another source [see above, p. 149], of the inheritance in lucerne of resistance to bacterial wilt (*Phytomonas insidiosa*) [*Aplano-*

bacter insidiosum: *R.A.M.*, xiii, p. 774] indicated that resistance behaves as an intergrading character and probably depends on a complex of genetic factors, an interpretation of which is not possible at present. The widely divergent proportions of resistant and susceptible F_2 individuals obtained by selfing wilt-resistant and susceptible plants would show that the composition of the parents may differ markedly in respect to the genes that govern their reaction to infection. The behaviour of 95 once-selfed families of the Hardistan variety suggested that there may be a slight inverse correlation between seed production and wilt resistance, but the evidence for this was by no means conclusive. There appeared to be no relationship between resistance and the morphology or winter-hardiness of the varieties tested.

CORMACK (M. W.). **On the invasion of roots of Medicago and Melilotus by Sclerotinia sp. and Plenodomus meliloti D. and S.**—*Canadian Journ. of Res.*, xi, 4, pp. 474–480, 1 pl., 1934.

A study was made of the invasion of lucerne and sweet clover (*Melilotus*) [*alba* and *officinalis*] roots by *Sclerotinia* sp. and *Plenodomus meliloti* [*R.A.M.*, xii, p. 635] in Alberta, with particular reference to the efficacy of wound cork in arresting the progress of these destructive pathogens.

The tests were carried out in the greenhouse and field on four varieties of lucerne (Grimm, Cossack, Baltic, and Liscombe) and four of sweet clover (White and Yellow Blossom, Arctic, and Maccor), differing in their capacity to withstand winter injury. Both the fungi used as inoculum were isolated from *Melilotus* roots on an oat hull medium. The *Sclerotinia* is thought by Dr. H. H. Whetzel to be possibly an undescribed species allied to *S. minor* [ibid., xiii, p. 241]. Both parasites proved capable of penetrating the uninjured external cork covering of the roots and any wound cork layers subsequently formed. The growing hyphae accumulated in close contact with the root and gradually ruptured the protective suberin layer prior to invading and killing the underlying tissues. A complete layer of wound cork seldom formed around the invaded area and what did form offered little resistance to invasion. With *P. meliloti* wound cork often did not form at all. The fact that tissue disorganization and suppression of wound cork formation occur in advance of hyphal permeation suggests that enzymatic activity may participate in these processes. No explanation is at present available of the arrest in the development of *P. meliloti* and the definite retardation in that of *S.* sp. after the commencement of vigorous growth in the plants during the spring.

HEADLEE (T. J.), MARTIN (W. H.), & FARLEY (A. J.). **Spraying recommendations for Apples. Spray schedule for Grapes. Spray schedule for Peaches. Spray schedule for Pears.**—*New Jersey Agric. Exper. Stat. Extens. Bulls.* 113, 115, 116, 117, 12 pp., 1934.

Directions are given in popular terms for the systematic application of standard sprays against some well-known fungous diseases and insect pests attacking apples, grapes, peaches, and pears in New Jersey [cf. *R.A.M.*, x, pp. 36, 39, 40, 75].

CHANDLER (W. H.), HOAGLAND (D. R.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees, III.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 70–86, 1934.

Further investigations conducted by the authors in California into the control of little leaf of fruit trees [*R.A.M.*, xiii, p. 39; xiv, p. 42] are described and discussed in considerable detail.

On peaches and apricots and to a less extent on plums, almonds, and apples autumn spraying with zinc-lime at concentrations not less than 16–6–100 tended to cause the production during the following spring of shoots bearing normal leaves from buds that if unsprayed would have given tufts of little leaves. On trees bearing mottled leaves in the summer growth one autumn spraying improved the setting of the fruit, while with apricots and early peaches it allowed the fruit to develop normally.

Spraying peaches and apricots in spring, when the little leaf symptoms are most pronounced, with zinc-lime at concentrations not under 10–5–100 improved the development of the fruit that set, but on peaches did not effect this early enough to cause more fruit to set. On very badly affected peaches freedom from leaf mottling continued later in summer after one spring than after one autumn application.

One annual application soon after growth started of zinc-lime 10–5–100 kept grape vines free from little leaf; applied at any time during summer zinc penetrated the leaves and was beneficial to the vines.

Injecting zinc sulphate into holes in the trunk and branches [ibid., xiii, p. 40] gave better results than any other method on deciduous trees, uniformly early and striking effects being obtained on walnuts, apples, and apricots, though the authors consider that injury may eventually result from the killing of the sapwood involved. The holes should be made at intervals of 3 or 4 in. When one branch is treated in this way the disease is cured on all the branchlets above the holes, while small laterals even 1 ft. below may be benefited. Evidence of improvement was obtained by introducing zinc dust and zinc oxide into holes bored in peach trunks; no injury was caused to the tissues round the holes filled with zinc oxide.

Practically all the observations made in 1933 supported the view that little leaf is a symptom of zinc deficiency affecting normal metabolism [loc. cit.], but in view of the facts that a vigorous, healthy tree may suddenly die without warning, that some trees recover without any increase in the zinc supply, and that in certain soils large woody perennials are generally susceptible while annuals remain unaffected, the authors are not convinced that the disease is due to zinc deficiency alone.

THOMAS (HAROLD E.), HANSEN (H. N.), & THOMAS (H. EARL). **Dematophora root rot.**—Abs. in *Phytopath.*, xxiv, 10, p. 1145, 1934.

The root rot caused by *Dematophora* [*Rosellinia*] *necatrix* is stated to have been responsible during the past five years for much damage to apple orchards in Santa Cruz County, California [cf. *R.A.M.*, vi, p. 560], and has also been found in at least one apricot orchard in

Alameda County [ibid., v, p. 305]. The pathogenicity of the fungus has been demonstrated on small apple and pear trees. The disease may be distinguished from those due to *Armillaria* [*mellea*] and *Xylaria* [*polymorpha*: ibid., xii, p. 100] by the absence of well-defined rhizomorphs and the presence of profuse, white, cottony mycelium adjacent to affected roots in moist air in the laboratory or in soil cavities in the orchard. Coremia of *R. necatrix* are occasionally found near the ground line on trees killed by the rot, besides being usually formed in pure cultures of the organism on steamed wheat or oats kernels.

Koch (L. W.). **Investigations on black knot of Plums and Cherries. II. The occurrence and significance of certain fungi found in association with Dibotryon morbosum (Sch.) T. & S.**—*Scient. Agric.*, xv, 2, pp. 80–95, 3 pl., 1934. [French summary.]

The results of the field observations and laboratory experiments reported in this paper showed that the black knot fungus (*Dibotryon morbosum*) is not genetically connected with any of the imperfect fungi which are frequently found in association with it in nature [*R.A.M.*, xiv, p. 44]. The work also gave clear evidence that *Cephalothecium* (*Trichothecium*) *roseum*, which consistently appears every year in July and August on black knots, actively parasitizes the stroma of *D. morbosum* and exerts an important biological control of the latter by reducing the number of mature perithecia which are formed. Over a period of four years the *Coniothyrium* sp. [loc. cit.] was freely isolated from all the black knots investigated, except those in their earliest stage of development, and also at all times of the year from the bark and buds of apparently healthy plums, cherries, peaches, apples, and pears. It is characterized by dark olivaceous (but inky-black in mass), mostly ovoid, but varying from short cylindrical to piriform pycnospores, 3·8 to 7·6 by 2·8 to 3·8 μ in diameter. In inoculation experiments it was shown to cause slight swellings but not typical knots on wounded plum and cherry branches. Further tests showed that during the later stages in the development of the knots in nature it produces an abundance of pycnidia around and inside both immature and mature perithecia of *D. morbosum*, with which it is not, however, genetically connected. When grown together in pure culture, the two fungi exhibited a mutual tolerance.

Fikry (A.). **Water-table effects. I. The gumming and death of Plum trees.**—*Min. of Agric. Egypt, Tech. & Sci. Service* (*Mycol. Sect.*) *Bull.* 141, 35 pp., 12 pl., 3 figs., 7 graphs, 1934.

In an investigation into a physiological disease of plum trees in Egypt marked by a gum exudation from the fruits, stems, and trunks followed by a drying-up of the branches and finally by the death of the trees, of the four rootstocks tested Mariana and Myrobolan were, respectively, 84 and 58 per cent. resistant, while apricot and peach were very susceptible [*R.A.M.*, xii, p. 749]. The most resistant scion varieties tested on the four stocks collectively were America, Japanese Gold Climax, and Mariana; Bokra, Myrobolan, and Excelsior were moderately resistant, and Wickson very susceptible. The Mariana rootstock is

shallow-rooting, while Myrobolan and apricot are comparatively deep-rooting.

From a correlation established between the incidence of the disease and the height of the water in wells bored in the plantation (trees round wells where the water was 70 cm. below soil surface on 10th September, 1931, being relatively much less resistant than others round wells where on the same date the water was 100 to 110 cm. below soil level) it is concluded that the condition is directly due to a high subsoil water-table during the Nile rise. If the orchard is on low-lying land the use of deeply-rooting stocks indirectly favours the disease. Trees on sandy soil were less severely and much less generally affected than those on clay soils.

Control lies in the provision of deep drainage in orchards that are already affected and in the use of resistant varieties worked on Mariana stock in new ones. The site should be as high as possible and the subsoil water-table not higher than 100 to 125 cm. below soil surface when the Nile flood reaches its maximum.

DUNEGAN (J. C.). **A disease of the English Morello Cherry caused by Bacterium pruni.**—*Journ. Agric. Res.*, xlix, 8, pp. 745–754, 4 figs., 1934.

The author's inoculation experiments and cultural studies of a bacterium isolated from 1931 to 1933 from diseased leaves and fruits of the Morello cherry (*Prunus cerasus*) received from Arkansas, Iowa, and Missouri, showed that it was identical with *Bacterium pruni* [*R.A.M.*, xiii, p. 172]. In the field the spots on the cherry leaves are similar in appearance to those caused by the organism on peach and plum leaves. On immature fruits they are circular, 0·5 mm. or less in diameter, and of a deeper green colour than normal; they gradually enlarge, and by the time they attain a breadth of 2 mm. their centre becomes sunken and is surrounded by an irregular, apparently water-soaked margin. The cherries appeared to be infected most commonly on their lower half. In some seasons the mature fruit is characteristically distorted by the production of slab-sided, flattened, or even triangular cherries, a feature which has not been seen in peaches or plums infected by *Bact. pruni*. In the cherries, furthermore, the bacteria were shown to be present in the tissues from the epidermis to the stone, and eventually to cause the complete destruction of all the cells in the invaded region.

The organism was also isolated from Morello twig cankers, in which it presumably overwinters to cause new infections the following spring, the outbreak of which is dependent on environmental conditions, and more particularly on rain. Secondary infections on the leaves, fruit stalks, and twigs may occur throughout the growing season; these infections are rather common on the small green cherries, but were observed only occasionally after the fruits turn red and begin to mature.

The disease is believed to be widespread in all the fruit-growing States east of the Rocky Mountains on the Morello and other varieties of cultivated cherries, failure to recognize it hitherto as a distinct disease being attributed to the similarity of the leaf spot caused by *Bact. pruni* to those produced by *Coccomyces hiemalis* [see above, p. 150], and to

the unusual symptoms on the mature cherries. The economic significance of the trouble is briefly discussed.

WILSON (E. E.). **A case of Almond blossom infection by Coryneum beijerinckii furnishing inoculum the following year.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1143–1144, 1934.

Coryneum beijerinckii [*Clasterosporium carpophilum*] is usually supposed to overwinter mainly in twig lesions, but in the spring of 1934 it was found [in California] sporulating on mummied almond blossoms blighted in the previous year [*R.A.M.*, ix, p. 766]. In 1934 the fungus also attacked the calyces during anthesis, the lesions in a few cases spreading downwards to the pedicel and blighting the blossom. From the calyx lesions the conidia may later spread to the young fruit and leaves. Even after abscission from the receptacle the calyces were observed to adhere to the developing fruits, on which numerous lesions were formed.

CHAMBERLAIN (E. E.). **A virus disease of Strawberries in New Zealand.** —*New Zealand Journ. of Agric.*, xlix, 4, pp. 226–231, 3 figs., 1934.

A brief account is given of a disease of strawberries, which is stated to be widespread and of increasing prevalence in New Zealand, diseased plants having been received from the Auckland, Poverty Bay, Nelson, Canterbury, and Otago districts. The symptoms agree closely with those of 'xanthosis' as described by Plakidas and of 'yellow edge' as described by Harris [*R.A.M.*, xiii, pp. 314, 784]. In controlled experiments in 1931 and 1934, the disease was transmitted to healthy plants (three out of ten in 1931 and three out of eight in 1934) by colonizing them with the aphid *Capitophorus fragariae* [ibid., xiii, p. 642] bred on diseased strawberry plants, all the controls remaining healthy; the first characteristic symptoms appeared in four months after inoculation in 1931 and in three months in 1934. Attempts to transmit the disease by rubbing the leaves of healthy plants with muslin moistened with juice from diseased leaves gave negative results.

The virus was shown to be transmitted from the mother plant to the runners, which, however, do not immediately develop the symptoms and may be set out as healthy plants, this being apparently the chief way in which the trouble is spread. Further dissemination is effected by *C. fragariae*, which is prevalent throughout New Zealand on the strawberry. The only effective means of controlling the disease is the use of planting material produced in an area far removed from strawberry-growing localities; it is also necessary to destroy all infected plants and their runners as soon as they appear in the nurseries and fruiting beds.

BERKELEY (G. H.) & LAUDER-THOMSON (ISABEL). **Root rots of Strawberry in Britain. The 'black lesion' type of Strawberry root rot.**—*Journ. Pomol. and Hort. Science*, xii, 3, pp. 222–246, 5 pl., 1 fig., 1934.

As a result of the investigations and inoculation studies reported in this paper, the authors state that five species of fungi among the numerous species isolated from strawberry roots affected with the 'black

lesion' type of rot in England [*R.A.M.*, xiii, p. 712] were found to be capable of parasitizing strawberry roots, namely, *Coniothyrium fuckelii* [*Leptosphaeria coniothyrium*: ibid., xiv, p. 12], *Hainesia lythri* [ibid., xi, p. 252], *Cylindrocarpon radicicola* [cf. ibid., xii, p. 224], *Fusarium orthoceras*, and *Pachybasium candidum* Sacc. All five fungi may occur either singly or in association in the field [ibid., xiii, p. 785]; they cause very similar, if not identical symptoms, including dwarfing and stunting of leaves and petioles, and drying and browning of the lower leaves, resulting in a flat type of plant, with subsequent death of severely diseased plants. Affected roots are noticeably deficient in fibre, and exhibit distinct black lesions on the white to yellowish-brown roots. In the spring the first symptoms are apparent on roots formed the previous autumn, followed later by attack on the roots formed in the current season. An attempt on the part of the host to slough off the parasite is indicated by the laying down of cork cells in affected areas.

The disease associated with these fungi is widely distributed in Europe and America, and appears to be distinct from the Lanarkshire 'red core' disease [ibid., xiii, p. 784] associated with a species of *Phytophthora*; it is believed to play a major part in the general degeneration of the strawberry. There was evidence that the 'yellow edge' disease [see preceding abstract], in its first season at least, has no detrimental effect on the root system of the strawberry. So far the only control measures feasible, apart from the possible use of resistant varieties, are crop rotation and the use in planting of runners selected from healthy plants.

ROBERTS (R. H.). **Strawberry 'black root' injury.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 295–296, 1 fig., 1934.

Strawberry plants growing in Wisconsin sometimes develop during spring a discoloration of the roots and the interior of the crown [*R.A.M.*, vii, p. 727] apparently induced by cold weather in late autumn. When mulching from early October to 1st December, 1932, was carried out at times corresponding with drops in the temperature, the plants mulched before the temperature fell to 20° F. remained uninjured, though the percentage of discoloured roots found after a temperature of 7° on 19th November on large, medium, small, and very young unmulched Dunlap plants was 3·6, 13·6, 50·6, and 94·8 per cent., respectively. Many of the roots were discoloured internally only. The Premier variety sustained more injury than the Dunlap, probably owing to the inadequate protection afforded by the thin habit of the former. In 1933, traces of injury became apparent after 10th November, when the temperature fell to 17° and marked injury resulted on 15th November, after a drop to 6°; plants mulched before the temperature fell to 20° again remained unaffected. No fungus or bacterium appeared to be consistently associated with the condition.

ZUNDEL (G. L.). **Raspberry diseases.**—*Pennsylvania Agric. Exper. Stat. Circ.* 133 (revised), 20 pp., 12 figs., 1934.

Brief, practical notes are given on the symptoms and control of the following diseases of raspberries in the United States: crown gall (*Bacterium tumefaciens*) [*R.A.M.*, xi, p. 428; xiii, p. 786], cane gall

[ibid., ix, p. 395], hairy root [*Bact. rhizogenes*], anthracnose (*Plectodiscella* [*Elsinoe*] *veneta*) [ibid., xiii, p. 358], *Septoria* leaf spot (*Mycosphaerella rubi*), spur blight (*M. rubina*) [*Didymella applanata*: ibid., x, p. 531], cane blight (*Leptosphaeria coniothyrium*) [ibid., xiii, p. 359], powdery mildew (*Sphaerotheca humuli*) [ibid., xii, p. 678], *Verticillium* wilt (*V. ovatum*) [ibid., x, p. 393], orange rust (*Gymnoconia interstitialis*) [ibid., xii, p. 104], red and yellow mosaics [ibid., xii, p. 770; xiii, p. 357], so-called 'speck' mosaic, apparently induced by cold on the leaves of black varieties [*Rubus occidentalis*], leaf curl (alpha and beta types) [ibid., x, pp. 195, 530], and mild and severe streak [ibid., xii, p. 230].

HAENSELER (C. M.). **Control of Dewberry anthracnose by spraying.**—*New Jersey Agric. Exper. Stat. Bull.* 574, 12 pp., 1 fig., 1934.

The results of four years' experiments [the results of which are discussed and tabulated] in the control of dewberry [*Rubus* spp.] anthracnose [*Elsinoe veneta*: *R.A.M.*, xi, pp. 626, 662] in New Jersey have led to the recommendation of the following spraying schedule: (1) delayed dormant application of concentrated lime-sulphur 1 in 20 (1 in 10 if rose scale [*Diaspis rosae*] is also severe) when the leaf buds are ¼ to ½ in. long; (2) 50–10–100 Bordeaux mixture about seven days before blossoming. This treatment resulted in increased yields of 39 and 33 per cent. over the unsprayed controls in 1931 and 1932, respectively.

STELL (F.). **Banana growing and associated diseases.**—*Proc. Agric. Soc. Trinidad and Tobago*, xxxv, 9, pp. 357–368, 1934.

In this paper, read before the Trinidad Agricultural Society, the author briefly discusses the requisite conditions for successful banana cultivation and points out that the proposed plantation of Gros Michel on the cacao estates in Trinidad appears to be scarcely justifiable on any other grounds than the depressed state of the cacao industry, as the extent to which the cacao fields are infected by Panama disease (*Fusarium* [*oxysporum*] *cubense*) is not known but is probably considerable. Notes are given on this disease, as well as on 'moko' (*Bacterium*) [*solanacearum*: *R.A.M.*, xiii, p. 713] and borer (*Cosmopolites sordidus*), and their control, and the paper terminates with recommendations on field sanitation, the avoidance of bruising the fruit, and the selection of planting material.

JOHANSSON (N.). **A contribution to the knowledge of the etiology of fruitlet black rot disease of Pineapple.**—*Svensk Bot. Tidskr.*, xxviii, 3, pp. 384–404, 1 fig., 6 graphs, 1934.

A full account is given of the writer's studies and experiments in Guatemala in connexion with the fruitlet black rot disease of pineapple [*R.A.M.*, xi, p. 473], also known as 'fruitlet brown rot', 'fruitlet core rot', and 'black heart', which is stated to occur in the West Indies, Haiti [ibid., v, p. 538], Central America, Queensland [ibid., viii, p. 53], and the Philippines [ibid., vii, p. 794].

The writer's observations on the symptoms of the disease generally confirm those described by Barker from Haiti and Serrano from the Philippines, though the discoloration of the fruit reported by the latter worker has only been noted in cases of very severe infection. The

attribution of the rot by these investigators to *Bacillus ananas* is also accepted by the writer.

Experiments are described which were conducted in 1928 on Smooth Cayenne pineapples in the cultures of the Guatemala Plantations Ltd., showing the relation of the disease to the incidence of rainfall during flowering. The pathogen would appear to enter the fruit through the newly opened flowers, since the fruits developing from inflorescences with all the flowers remaining closed were always found to be quite sound, despite heavy rains. In general, the basal eyelets of a fruit are the most liable to attack, the entrance of their flowers presumably forming a convenient target for splashing raindrops which may collect round them in small pools. The risk of infection from this source is greatest during the first days of flowering. Fruits subsequently matured in isolation bags of parchment paper were usually found to be more severely infected than those not so treated. Spraying with mercuric chloride, potassium permanganate, or formaldehyde, and dusting with flowers of sulphur did not noticeably reduce the percentage of diseased fruits but served to some extent to prevent the spread of infection.

WARDLAW (C. W.), LEONARD (E. R.), & BAKER (R. E. D.). **Observations on the storage of various fruits and vegetables. I. Tomatoes, Cauliflowers, String Beans, Egg-plant, Cucumbers, and Musk-melons. II. Papaws, Pineapples, Granadillas, Grapefruit, and Oranges.**—*Trop. Agriculture*, xi, 8, pp. 196–200; 9, pp. 230–235, 2 graphs, 1934.

Continued trials at the Low Temperature Station, Trinidad, showed that fairly wide variations in manurial treatment have no marked influence on the keeping quality of the locally grown tomatoes, provided the fruit is picked green and free from damage, and also confirmed that fungal wastage during and after storage is almost exclusively due to *Phoma destructiva* [*R.A.M.*, xii, p. 794]. Among the other vegetables tested, cucumbers stored at 45°, 50°, and 60° F. all showed after the 30th day considerable wastage, the more serious types of which were caused by *Colletotrichum lagenarium*, *Fusarium* spp. including *F. succisae*, *Mycosphaerella citrullina* [ibid., x, p. 771], *Cladosporium cucumerinum* [ibid., xii, p. 485], and *Macrosporium cucumerinum* [*Alternaria cucumerina*: ibid., xi, p. 557].

Perhaps the most common cause of storage wastage in papaws is stated to be a species of *Gloeosporium* with typically elongated, cylindrical conidia with rounded ends (occasionally slightly concave and pointed at one extremity), measuring 16 to 20 by 4 to 6μ. Occasionally this fruit is also attacked by *Phomopsis papayae* [ibid., v, p. 189] and by *Fusarium dimerum* var. *pusillum* Wr. No fungal wastage during storage was observed in granadilla (*Passiflora macrocarpa*) fruits except for small spots caused by an undetermined fungus (?*Phleospora* or *Septoria* sp.) which is present on the fruits while still on the vines. The commonest cause of storage wastage in grapefruit is stated to be blue mould (*Penicillium italicum*), but some loss in the trials was also caused by green mould (*P. digitatum*) either alone or in association with the former. *Phomopsis* [*Diaporthe*] *citri* [see above, p. 161] was also observed causing a pliable, leathery, brown rot on the grapefruit surface, and

a soft rot of over-ripe or fallen fruits was caused by *Colletotrichum gloeosporioides* [ibid., xiii, p. 693].

HOFFMAN (M. B.). **Carbon dioxide assimilation by Apple leaves as affected by lime-sulphur sprays. II. Field experiments.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 169–175, 1934.

Orchard experiments [which are described, and the results of which are tabulated] to ascertain the effect of lime-sulphur spraying on the carbon dioxide utilization of apple leaves, ordinary summer strength lime-sulphur (2½ in 100 galls.) being applied by means of a small atomizer to both surfaces of the leaves, in general confirmed the results obtained in previous tests in the greenhouse [*R.A.M.*, xiii, p. 34].

One leaf sprayed on a sunny afternoon when the temperature was 29° C. next day showed a reduction of 41 per cent. in its assimilation of carbon dioxide, as compared with a loss of only 5 per cent. efficiency in an untreated leaf on an adjoining twig of the same tree. Although the maximum reduction in assimilation attributable to spraying occurs on the day after treatment, the reduction shown by the sprayed leaf continued in an appreciable and consistent amount for seven days, after which the observations were discontinued. Practically the same results were obtained with two other sprayed and unsprayed leaves.

When three leaves on two comparable trees were sprayed at 1.40 p.m. (temperature 21·5°) and three others on the same trees at 6.45 p.m. (temperature 16°) on the same day, all six showed reduced carbon dioxide assimilation during the next three days, but the reduction was greater in the leaves sprayed at the higher temperature.

New Jersey [sulphur-lime] dry-mix [ibid., v, p. 311] caused less reduction in efficiency of assimilation than lime-sulphur spray, the data obtained suggesting a difference in the effects of the mixtures on photosynthesis.

Copper emulsion.—*Trop. Agriculturist*, lxxxiii, 4, pp. 255–256, 1934.

The method for the preparation of 4 galls. of copper emulsion [*R.A.M.*, xiii, p. 332] recommended in this brief note is to dissolve separately 13 oz. of soft soap and 2½ oz. of finely powdered copper sulphate crystals each in 2 galls. of soft water, and then to pour the copper sulphate solution into the soft soap one, at the same time stirring the latter constantly. Care should be exercised in weighing the two ingredients accurately, since excess of copper sulphate results in the formation of a sticky, green precipitate which spoils the emulsion, and excess of soap causes spray injury to the plants. The green precipitate is also produced if the soap solution is poured into the copper sulphate one. If properly prepared, the copper emulsion should be a thin, even, opaque liquid of a pale turquoise-blue.

This preparation is stated to be a cheap and efficient substitute for Bordeaux mixture which, owing to the difficulty of obtaining good lime, is hard to prepare satisfactorily in Ceylon.

BULLER (A. H. R.). **Researches on fungi. Volume VI.**—xii+513 pp., 231 figs., London, Longmans, Green & Co., 1934.

The present volume of the author's well-known Researches on Fungi

[cf. *R.A.M.*, xii, p. 776] makes contributions to the knowledge of certain Phycomycetes, Ascomycetes, and Basidiomycetes.

Part I, comprising four chapters, deals with the biology and taxonomy of *Pilobolus*, the ocellus function of the subsporangial swelling in which is discussed in detail. A new species, *P. umbonatus*, is fully described with English and Latin diagnoses, while the final chapter of this section, a systematic account and arrangement of the Pilobolidae, is contributed by W. B. Grove.

The three chapters of Part II relate to spore production and liberation in the Discomycetes.

In Part III, also containing three chapters, the function of pseudorhizae and 'gemmifers' in the life-histories of certain Hymenomycetes is discussed. Gemmifers, as found in *Omphalia flavida*, the agent of the western coffee leaf disease [ibid., xii, p. 168], in which they have hitherto been misnamed '*Stilbum*-bodies', consist of a slender, solid, tapering pedicel about 2 mm. long and of a terminal, detachable, multicellular, knob-shaped gemma, approximately 0·36 mm. in diameter. The periphery of the upper (oblate-spheroid) part of the gemma is covered with aerial radiating filaments, termed by the author 'infection hyphae', which can penetrate and infect a new host leaf when a gemma has fallen upon it. From a comparison of the external form and internal structure of a gemmifer and of a sporophore of *O. flavida*, it may be inferred that a gemmifer is a highly specialized sporophore in which the pedicel and gemma are homologous with the stipe and pileus, respectively. The actual sporophores in this fungus are much larger than the gemmifers, being 0·6 to 1·5 cm. in height with a pileus 1·5 to 2·5 mm. in diameter. The abscission of a gemma of *O. flavida* from the end of its pedicel, preparatory to detachment by the wind, takes place while the apophysis of the gemma firmly clasps the pedicel subterminally, and is effected by the development of a sigmoid curve at the end of the stipe, which thus withdraws itself from the gemma. When a gemma falls on to a leaf, it usually settles on its slightly concave upper surface, from which, under moist conditions, the above-mentioned infection hyphae resume growth and invade the foliar tissues of suitable hosts. In a damp atmosphere detached gemmae of *O. flavida* retain their viability for over 24 hours, but they rapidly succumb to desiccation. On inoculation with *O. flavida* gemmae, wounded and unwounded leaves of *Bryophyllum calycinum* and uninjured, isolated leaves of *Nerium oleander* and *Ficus* sp. developed lesions successively giving rise to gemmifers and sporophores of the fungus. On the other hand, isolated leaves of *Plumbago capensis*, similarly treated, developed spots producing gemmifers only. A list is given of the plants, belonging to widely separated families of phanerogams, susceptible to infection by *O. flavida*, which is also pathogenic to ferns. Gemmifer production in this organism takes place only in response to the stimulus of light. Both in nature and in culture the mycelium of *O. flavida* is luminous. In a Porto Rican coffee plantation Prof. A. Müller could clearly discern the leaf spots due to the fungus at a distance of 2 to 3 ft. at night.

A description is given of the gemmifers, similar to the foregoing, produced by *Sclerotium coffeicola*, the causal organism of a coffee disease in Dutch and British Guiana and Trinidad [ibid., xi, pp. 26,

283]. These organs, consisting of a small, white, knob-shaped pedicel and a detachable, slender, white, acicular gemma, 1·5 to 4 by 0·05 to 0·1 mm., are considered to be modified fruit bodies (possibly of a *Typhula*), with functions similar to those of the analogous structures in *O. flavida*. The mycelium of *S. coffeicola* is furnished with clamp-connexions, indicating that this fungus also belongs to the Basidiomycetes.

GRATIA (A.) & MANIL (P.). **Différenciation sérologique des virus X et Y de la Pomme de terre chez les plantes infectées ou porteuses de ces virus.** [The serological differentiation of the X and Y potato viruses among plants infected by these viruses or carriers of them.] —*Comptes rendus Soc. de Biol.*, cxvii, 31, pp. 490–492, 1934.

Continuing the serological researches on plant viruses initiated by the first-named writer [*R.A.M.*, xiii, p. 542], the authors prepared sera from the juice of the following potato plants supplied by Quanjer from Holland: (1) normal President, (2) and (3) the same infected by the X and Y viruses, respectively, and (4) Duke of York bearing the X virus in a latent condition with no external symptoms. To these were added a fifth serum prepared from the Wilkopolenka de Poniak variety found at Gembloux (Belgium) with pronounced symptoms of the Y virus, and four sera obtained previously from ordinary mosaic potato plants in Belgium (probably the X virus).

Tested on juices prepared from healthy tobacco and potato, and also from the various mosaic-diseased plants, the anti-X sera produced extensive flocculation of all X-infected tobacco and potato plant juices containing the virus either in an active or latent form. On the other hand, they are without effect on the juices of healthy or Y-infected plants as well as on those attacked by tobacco or beetroot mosaic. K. Smith's X virus is thus a serologically distinct entity. The anti-X sera further produce flocculation in tobacco juice from plants inoculated with *Hyoscyamus* mosaic [ibid., xiv, p. 51] and also in that from potato tubers actively or latently infected by X mosaic. The latter observation is considered to be of practical importance as a means of eliminating diseased material in the work of seed selection. The infective principle appears to be much more plentiful in the outer layer of the tuber than in the central pulp, judging by the relative facility of flocculation.

The anti-Y sera are inactive not only on the juices of X-infected plants but also on those containing the Y virus. The negative results may be due either to the absence of antigenic properties in the Y virus; to its extreme frailty as compared with the high degree of resistance to adverse environmental conditions shown by X; or to its actual paucity compared with X. Possibly the delicacy of the Y virus may also necessitate special experimental conditions on which further researches are to be conducted.

GRATIA (A.) & MANIL (P.). **Les complexes de virus des plantes et la méthode sérologique.** [The complexes of plant viruses and the serological method.]—*Comptes rendus Soc. de Biol.*, cxvii, 31, pp. 493–494, 1934.

Previous studies by the first-named writer suggested a close analogy

between the mechanism of the virus diseases of plants and the bacteriophage phenomenon [*R.A.M.*, xiii, p. 276], and this line of research was followed up by an attempt to unite certain virus complexes in such a way that each of the components would attack a different tissue system, just as certain bacteriophages can be separated into varieties each attacking a single strain of the *Bacillus* tested. It has been experimentally shown that the X virus of potatoes induces lesions of the inner phloem and adjacent tissues, while the Y virus causes disintegration of the collenchyma (Quanjer's 'top necrosis' or 'acronecrosis' and 'acropetal necrosis', respectively) [ibid., x, p. 746; xi, p. 741; xiii, p. 798]. The complex of these two viruses produces a much more severe mosaic known as 'crinkle' [ibid., x, p. 615; xi, p. 738]. The synergism of the X and Y viruses is particularly evident in tobacco plants, which are totally destroyed with great rapidity by the complex, whereas each component singly causes only partial necrosis. Similarly, Murphy's moderately virulent A virus [ibid., xiii, p. 258] produces only mild mosaic symptoms in normal potato varieties, such as Irish Chieftain, President, and Arran Victory, whereas in masked carriers of the X virus, e.g. Up-to-Date, it causes a very severe and often fatal disorder, probably resulting from synergism between the new and the latent virus. These facts entirely corroborate the conclusions drawn from previous studies, which indicate that the latent virus is not to be regarded as a normal physiological constituent of the carrier plant, but as an alien element or antigen of a pathological character tolerated by the host in ordinary circumstances.

BIRKELAND (J. M.). **Photodynamic action of methylene blue on plant viruses.**—*Science*, N.S., lxxx, 2077, pp. 357–358, 1934.

Following the technique used by Perdrau and Todd (*Proc. Roy. Soc.*, B, cxii, p. 277, [1933]) in their study of the photodynamic action of methylene blue on nine animal viruses and several strains of bacteriophage, the writer investigated this factor in relation to Wingard's ring spot, streak (single virus streak) of tomato, and tobacco viruses 1 and 6 (Johnson), the last-named also known as the aucuba mosaic virus [*R.A.M.*, xiv, p. 127]. Ten c.c. of the virus-dye mixtures at P_H 5·8 to 6·0 were exposed in Petri dishes to a 500-watt lamp at a distance of 26 in. At various intervals 0·10 c.c. of the mixture was removed and used for the inoculation of test plants.

Judging by the results of infectivity tests on tobacco and cucumber, the ring spot virus was completely inactivated by two minutes' exposure. After 20 minutes the virulence of the streak virus was slightly reduced, but no diminution in the strength of tobacco viruses 1 and 6 was effected by one hour's exposure. Thionine, potassium indigo-disulphonate, and phenol-indo-phenol at hydrogen-ion concentrations of P_H 3·0, 7·0, and 8·0 also failed to reduce the virulence of tobacco virus 6.

It would appear from these data that plant viruses are generally more resistant to the photodynamic action of dyes than are animal viruses or bacteriophage.

HATCH (A. B.). **A jet-black mycelium forming ectotrophic mycorrhizae.** —*Svensk Bot. Tidskr.*, xxviii, 3, pp. 369–383, 6 figs., 1934.

This is a fuller account of the jet-black, slow-growing mycelium, provisionally designated *Mycelium radicis nigrostrigosum*, isolated from a distinctive form of black mycorrhiza of *Pinus sylvestris* in a northern Swedish experimental forest. Pure culture syntheses showed that the mycelium under observation grows very slowly, remains jet-black even to the tips of the hyphae, and forms typical mycorrhiza with *P. strobus* and *P. resinosa* [*R.A.M.*, xii, p. 386, 778].

Externally the mycorrhiza are characterized by a profusion of coarse, lustrous, jet-black hyphae, arranged in palisade-like groups, radiating from the pseudoparenchymatous mantle and distinguishable, under a low-power microscope, from those of the *M. r. atrovirens* type with which they were formerly confused. The individual hyphae of the mantle of *M. r. nigrostrigosum* on *P. strobus* measured 4 to 15 μ in width and the mantle itself was 30 to 60 μ in thickness. Hyaline intercellular hyphae, 4 to 5 μ broad, extend to the endodermis and form a network. The new mycelium has been found forming mycorrhiza on a large number of trees (besides pine) and shrubs, including *Picea*, *Abies*, *Pseudotsuga*, and *Tsuga* spp., larch, oak, beech, birch, *Carya* sp., and *Corylus rostrata*. It is widely distributed in Sweden and the United States and appears to be also found in Japan, being generally most abundant in relatively poor soils, and is considered to be undoubtedly responsible for the formation of the dark mycorrhiza previously attributed to *Rhizoctonia sylvestris* Melin.

HATCH (A. B.). **A culture chamber for the study of mycorrhizae.**—*Journ. Arnold Arboretum*, xv, 4, pp. 358–365, 1 pl., 1 fig., 1 diag., 1934.

The writer describes in detail and figures a chamber specially constructed for the purpose of establishing and maintaining pure cultures of mycorrhiza with a view to the investigation of the exact nature of mycotrophic relationships [*R.A.M.*, xiii, p. 458, and preceding abstract].

WEINDLING (R.). **Some factors influencing the character of interaction between Trichoderma and other soil fungi.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1140–1141, 1934.

Various internal and external factors have been found to affect the character of the interaction on nutrient media between *Trichoderma* and other soil fungi [*R.A.M.*, xiv, p. 53], the parasitic action of the former being suppressed under certain conditions of acidity, moisture, or temperature, and the colonies showing either mutual inhibition or compatibility. These phenomena can be connected with the properties of a lethal principle of *Trichoderma*. The action of *Trichoderma* is also modified by the host; in the case of *Pythium*, for instance, a lethal effect is readily obtained but is rarely accompanied by coiling round the hyphae.

WEINDLING (R.). **Various fungi recently found to be parasitic on Rhizoctonia solani.**—Abs. in *Phytopath.*, xxiv, 10, p. 1141, 1934.

Under experimental conditions the following fungi attacked *Rhizoctonia* [*Corticium*] *solani* in culture in a manner similar to that of *Trichoderma* [see preceding abstract], their virulence decreasing in the order given: *Acrostalagmus* spp., *Aspergillus niger*, *Penicillium* spp., *Fusarium lateritium* [*R.A.M.*, xiii, p. 108], *Botrytis cinerea*, and *Verticillium* spp.

WEINDLING (R.) & FAWCETT (H. S.). **Experiments in biological control of Rhizoctonia damping off.**—Abs. in *Phytopath.*, xxiv, 10, p. 1142, 1934.

Experiments in the protection of citrus seedlings from damping-off by *Rhizoctonia* [*Corticium*] *solani* in sterilized soils [in California] by inoculating the latter with *Trichoderma* [see preceding abstracts] were more successful at acid than at neutral reactions. The treatment was extended to non-sterilized soils with encouraging results. Since the growth of *C. solani* declines at very acid reactions its control through soil acidification is suggested to be primarily due to the increased antagonistic activities of other soil organisms, such as *Trichoderma*.

CARBONE (D.). **Sur la nature de la 'barrière' dans le Haricot vacciné et infecté de 'toile'. (Communication préliminaire.)** [On the nature of the 'barrier' in vaccinated Bean infected with 'toile'. (Preliminary communication.)]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 9, pp. 301–303, 1934.

When sections of an unvaccinated bean [*Phaseolus vulgaris*] plant inoculated with 'toile' disease [*Botrytis cinerea*: *R.A.M.*, xiii, p. 795] were stained with Ruzicka's liquid (which stains dead cells blue and living red) the mass of necrosed cells appeared as a bluish-black clump bounded by a layer of polygonal-celled wound tissue in which all the cells were coloured red (showing that they were still living when sectioned), except for a blue-black border along the innermost ones. The chloroplasts were everywhere small and few; in the blue cells they were often absent, and when present were stained blue.

In the pith of the plant vaccinated prior to inoculation only the cells in the middle of the diseased area were entirely bluish-black; around these were blue cells with blue precipitates and red ones with blue precipitates; around these again the cells were red. The chloroplasts, which were mostly of normal size, were abundantly present in cells either completely red or containing blue precipitates. Green plastids were noted in the blue cells. In another vaccinated plant which succumbed to inoculation the hyphae growing from the cells stained red failed to penetrate the layers farther out which had thickened blue walls and blue precipitates.

These observations show that the morphological transformation of the medullary cells from normal to the characteristic barrier formation began when they were still in full vital activity, typical dead cells appearing progressively later. They confirm the view that the immunity from toile disease conferred on beans by vaccination belongs to the

'hyperreactive hypersensibility' type which includes the examples of natural phyto-immunity studied by Dufrénoy and others [cf. ibid., xi, p. 391; xiii, p. 116].

Brown (W.). **Mechanism of disease resistance in plants.**—*Trans. Mycol. Soc.*, xix, 1, pp. 11–33, 1934.

In this presidential address to the British Mycological Society, delivered on 19th September, 1933, the author gives a brief, general survey of the data so far obtained in the studies of the highly complex problem of resistance in plants to parasitic diseases. He restricts himself chiefly to the physiological aspects of parasitism, which is considered solely from the chemical and physical points of view, and reviews the various theories which have been advanced to explain the penetration of the parasites into the host tissues. In his opinion, the mechanical factor in plant resistance may be discounted, at least in cases where enzymatic action exerted by the parasite is clearly marked. In considering the question of chemical resistance, he does not believe that the search for substances in the hosts, inhibiting the entry and development of the parasite, will lead to any general solution of selective parasitism; much more promising appears to be the theory which attempts to explain the problem by enzymatic activity of the parasites, and a brief outline is given of the progress made on these lines by himself and some other workers [cf. *R.A.M.*, xiii, p. 530].

Viennot-Bourgin (F.). **De l'influence des facteurs climatiques de 1933 et 1934 sur le développement de quelques parasites cryptogames.** [On the influence of the climatic factors of 1933 and 1934 on the development of some cryptogamic parasites.]—*Comptes rendus Acad. d'Agric. de France*, xx, 26, pp. 839–843, 1934.

In a recent article E. Foëx has stated that a high relative humidity (70 to 100) and a few days' rainfall promote the late infection of potato tubers by *Phytophthora infestans* without any external sign of disease on the foliage. This was exemplified in serious outbreaks on the Eerstelingen [Duke of York] variety in Pas-de-Calais (29th July, 1933) and at the Versailles Agricultural Research Institute during October [*R.A.M.*, xiii, p. 467]. In the same year slight attacks occurred at Grignon on the leaves of Abondance de Montvilliers, Duke of York, and Paulsen's Juli on 3rd July as a sequel to rains from 12th to 16th and 29th to 30th June. A fungicide was applied on the 5th and no further infection was observed, but on lifting and during storage a number of Bintje tubers showed typical late blight symptoms and developed the conidiophores and conidia of *P. infestans* in a moist chamber.

In 1934 the summer drought was even more excessive than in the preceding year. At Grignon a virulent outbreak of late blight occurred during the first week of October, following rain and high temperature (round about 26° C.) from 29th September to 4th October, on the foliar tufts at the tips of the haulms in certain varieties which had previously (mid-September) presented a positively scorched appearance. The extensive lesions bore profuse conidial fructifications. On lifting, some tubers were more or less severely rotted and after a week's storage

the K. of K. and Preussen varieties were heavily infected. It is apparent from these data that, under exceptional climatic conditions and even in the absence of Van Everdingen's requirements for a late blight epidemic [ibid., v, p. 628], serious attack may take place at an advanced stage of vegetation, when the infection tends to become rapidly localized in the ripening tubers.

Perithecia of *Microsphaera quercina* were abundant on oak (*Quercus sessiliflora*) shoots [ibid., xiii, p. 810] on the dry, calcareous slopes of the Grignon estate in October, 1934.

HARTISCH (J.). **Stoffwechselphysiologische Untersuchungen über die Blattrollkrankheit der Kartoffelpflanze.** [Metabolic and physiological investigations on Potato leaf roll.]—*Planta*, xxii, 5, pp. 692–719, 6 graphs, 1934.

Following a brief survey of previous work on the metabolic changes in potatoes affected with leaf roll [*R.A.M.*, xii, p. 48; xiii, p. 533], the writer gives a comprehensive, tabulated account of the results of his investigations of this problem at Leipzig University.

By means of iodine staining appreciable qualitative differences were detected between diseased and healthy material in the dextrin production accompanying starch hydrolysis, while quantitative methods specially devised for the separation of the dextrins from other carbohydrates in the expressed sap also showed that dextrin formation is greater in diseased than in healthy leaves and tubers. All the data relating to extra dextrin production in diseased potatoes pointed to an enhanced activity of the dextrinogen-amylases, the optimum reaction for which was P_H 3·5 to 4·5 as compared with 6·5 to 7·0 in healthy plants. The increased activity of the dextrinogen-amylases in affected plants would appear to bear some etiological relation to leaf roll.

A preliminary study of the effects of increased dextrin production on certain physiological processes, such as assimilation and respiration, has yielded promising results.

JONES (L. K.). **The rate of spread of the veinbanding virus on Potatoes.**—Abs. in *Phytopath.*, xxiv, 10, p. 1144, 1934.

In the summer of 1933 plantings of from 2 to 13 hills each of 31 virus-free seedling strains and ¼ acre of virus-free Early Rose potatoes were made near Pullman, Washington, at least ¼ mile from soil that had ever borne potatoes. The new plantings were surrounded by barley and lucerne fields. During the growing season natural infection by the veinbanding virus [*R.A.M.*, xiii, p. 533] was observed on the potato plants as follows: 13 seedling strains, 100 per cent.; 6 seedling strains, over 50 per cent.; Early Rose, 59 per cent.; 5 seedling strains, 10 to 50 per cent.; 7 seedling strains, nil.

KOCH (K.). **Aphid transmission of Potato yellow dwarf.**—*Phytopath.*, xxiv, 10, pp. 1126–1127, 1934.

The results of experiments under controlled greenhouse conditions in Wisconsin indicated that the peach aphid (*Myzus persicae*) may be largely responsible for the transmission of yellow dwarf of potatoes [*R.A.M.*, xiii, p. 721] in the field, an average of 60·5 per cent. infection

having been secured on Rural New Yorker, Irish Cobbler, and Bliss Triumph plants to which *M. persicae* was transferred from diseased Irish Cobblers. So far the outcome of similar tests with *Macrosiphum solanifolii* [*M. gei*] and *Thrips tabaci* has been mainly negative.

VINCENT (C. L.) & PAWSON (W. W.). **Factors affecting Potato seed piece decay.**—*Proc. Amer. Soc. Hort. Sci. 1933*, xxx, pp. 491–495, 1934.

Field and greenhouse tests carried out in Washington State showed that when potato seed pieces were sown in soil kept at 70° F. or over a relatively large amount of decay occurred. The decay of sets from sprouted tubers planted in soil at 70° or over was minimized by previously suberizing the cut surface in humid air. The storage of cut seed potatoes in a thin layer openly exposed to dry air (30 to 40 per cent. relative humidity) reduced germination, especially when the seed was planted in soil the temperature of which was over 70°. When the soil was kept 'soggy wet' for a long period much seed-piece decay occurred, indicating that poor stands resulting from early spring planting may be due partly to wet soil from which the air is excluded. Drying agents, such as lime, sulphur, and gypsum, were detrimental to cut seed when the potatoes were planted after the soil temperature had reached 70° or more, sulphur being particularly injurious.

SCOTT (C. E.) & THOMAS (H. EARL). **Downy mildew of the Hop in California.**—Abs. in *Phytopath.*, xxiv, 10, p. 1146, 1934.

The apparent incubation time for the leaf spots produced by *Pseudoperonospora humuli* on hops in California [*R.A.M.*, xiii, p. 802] in infections in late May and June, 1934, was 7 to 9 days, while for spike production it was 9 to 11 days. The infection periods were marked by rains preceded and followed by comparatively dry weather.

MCRAE (W.) & SUBRAMANIAM (L. S.). **Effect of mosaic on the tonnage and the juice of Sugar-Cane in Pusa, part IV.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 787–796, 1934.

In further investigations on the injury caused by sugar-cane mosaic in North Bihar, India [*R.A.M.*, xiii, p. 268], 36 plots of healthy and diseased Co. 213 cane were laid down alternately. A very small amount of infection spread to the mosaic-free plots, one clump becoming affected in each of seven plots. A count of the shoots after 11 weeks showed that germination was 4 per cent. less in the mosaic plots than it was in the healthy ones. This reduction of germination was confirmed by placing pieces of cane, each containing an eye, in moist sawdust in partial shade at temperatures ranging from 64° to 100° F.; of 500 eyes from healthy cane 437 germinated as against 419 for the mosaic cane, a difference of 3·6 per cent. When allowance was made for the loss in weight caused by insect attack, the mean weight of the stripped cane in the healthy and diseased plots was 46·12 and 40·62 maunds (1 maund = about 82 lb.), respectively, these figures representing a loss in weight due to mosaic alone of 11·9 per cent. The amount of juice extracted from the mosaic cane was 0·77 per cent. less than that

obtained from the healthy cane, though the quality, as measured by brix, glucose, sucrose, and purity remained unimpaired.

In the four successive seasons during which similar tests have been made the weight of the cane was less in the mosaic than in the healthy plots three times, the average difference being 8·2 per cent. per season; percentage juice to cane, brix, and glucose were each less twice, while glucose and purity were less once. The evidence so far obtained indicates that in Co. 213 mosaic probably reduces the weight of the cane, but there was no clear evidence that it affects the quality of the juice.

The figures given in the present paper refer to wholly mosaic-infected and mosaic-free canes, but locally, except in the experimental plots, no field of wholly infected Co. 213 cane exists, the average amount of infection in 1933 being only 0·58 per cent.; a 12 per cent. loss in weight of stripped cane in a wholly infected field is equivalent to a loss of only 0·07 per cent. on the ordinary crop [ibid., xiv, p. 80].

LODDER (JACOMINA). **Die Hefesammlung des 'Centraalbureau voor Schimmelcultures': Beiträge zu einer Monographie der Hefearten. II. Teil. Die anaskosporogenen Hefen. Erste Hälfte.** [The yeast collection of the 'Centraalbureau voor Schimmelcultures': contributions to a monograph of the yeast species. Part II. The anascosporogenous yeasts. First half.]—*Thesis, Univ. of Utrecht*, 256 pp., 1 pl., 114 figs., Amsterdam, N. V. Noord-Hollandsche Uitgeversmaatschappij, 1934.

This comprehensive, fully documented study on the anascosporogenous yeasts deals only with a part of the extensive collection at the 'Centraalbureau voor Schimmelcultures', Baarn [cf. *R.A.M.*, x, p. 692] namely, the Rhodotorulaceae (comprising the species containing carotinoid pigments) [cf. ibid., v, p. 229] and one of the subfamilies of the Torulopsidaceae, i.e., the Torulopsoideae, the second subfamily, the Mycotoruloideae, being reserved for future treatment.

A critical review of the literature on the taxonomy of the anascosporogenous yeasts led to their division into three families, Rhodotorulaceae, Nectaromycetaceae, and Torulopsidaceae and the adoption of Ciferri's and Redaelli's system of classification of the Torulopsidaceae as amended by Langeron and Talice [ibid., xi, p. 476]. The author, however, reserves judgement as to the retention of the conidium-forming Nectaromycetaceae, though provisionally keeping it in this group. Since *Sporobolomyces* has been referred by Buller to the Basidiomycetes [ibid., xii, p. 777], only the doubtful genus *Nectaromyces* would remain. In the course of the investigations the need for keeping the carotin-containing forms in a separate family (the above-mentioned Rhodotorulaceae with the single genus *Rhodotorula* Harrison) became obvious, and 37 of the 160 anascosporogenous strains examined were accordingly placed in this family, representing 13 species and 10 varieties of *Rhodotorula*. The remaining 125 strains fell in the family Torulopsidaceae, having no conidia and no carotin. Of these 37 were found to form a pseudomycelium and sporiferous apparatus and were referred to the Mycotoruloideae while the other 86 belong to the Torulopsoideae, having no, or at most a primitive, pseudomycelium without any sporiferous apparatus. The Torulopsoideae comprise the

following genera: *Torulopsis* Berlese, *Pityrosporum* Sabouraud, *Mycoderma* Persoon emend. Leberle, *Kloeckera* Janke [ibid., xiii, p. 370], *Asporomyces* Chaborski, *Trigonopsis* Schachner, and *Schizoblastosporion* Ciferri. No justification can be found for the retention of *Eutorulopsis*, *Schizotorulopsis*, and *Microblastosporon*.

Torulopsis is sub-divided into two groups, each containing eleven species and one variety, (a) comprising the species capable of fermentation and (b) those devoid of this property. The three species of *Pityrosporum* [ibid., x, p. 311; xi, p. 642] (*P. malassezi*, *P. pachydermatis*, and *P. rhinoserosum*) are reduced to two, the last-named having been found identical with the second. Six species of *Mycoderma* are recognized and ten of *Kloeckera* (with one variety), while the genera *Asporomyces*, *Trigonopsis*, and *Schizoblastosporion* are each represented by only one species—*A. asporus*, *T. variabilis*, and *S. starkeyi-henricii*. Each of the genera under discussion is furnished with a key for the determination of the species comprised therein, and in conclusion a key is also given for the recognition of the seven genera constituting the subfamily Torulopsoideae.

Wilson (M.). **The distribution of the Uredineae in Scotland.**—*Trans. Bot. Soc. Edinburgh*, xxxi, 3, pp. 345–449, 1934.

A fully annotated list is given of 240 species of rusts occurring in Scotland, some 30 of which have not been recorded from England. Detailed descriptions are provided of the species not included in Grove's 'British Rust Fungi' (1913).

Lowe (J. L.). **The Polyporaceae of New York State (pileate species).**—*Bull. New York State Coll. of Forestry Techn. Publ.* 41, 142 pp., 2 pl., 1934.

An extensively annotated list, supplemented by a glossary, bibliography, index of genera and species, and synoptical key of the generic and specific arrangement, is given of 146 pileate Polyporaceae known to occur in New York State.

Bose (S. R.). **Polyporaceae of Bengal Part X.**—Reprinted from *Journ. Dept. Sci.*, xi, 19 pp., 5 pl., 1934.

An annotated list, supplemented by a bibliography of 33 titles, is given of 15 Polyporaceae found in Bengal, including *Fomes pinicola* [*R.A.M.*, xiii, p. 604] on dead *Tsuga brunoniana* at Darjeeling (previously detected in Assam on *Pinus khasya* and in Burmese pine forests); *F. albomarginatus* on bark of living *Shorea robusta* at Jalpaiguri, and *F. conchatus* [ibid., v, p. 265] growing on a mango tree trunk in the Calcutta district (also in Bombay).

Grove (W. B.). **Mycological notes. VII.**—*Journ. of Botany*, lxxii, 862, pp. 265–271, 1 fig., 1934.

These notes include a description of *Septoria gladioli* [*R.A.M.*, xiv, p. 12] on *Gladiolus* leaves from Cyprus, a study of which has persuaded the writer that the two pycnidial forms comprised in the material, characterized by (1) *Ascochyta*-like, linear-fusoid, uni- (possibly sometimes bi-) septate spores, 24 to 30 by 3·5 to 4 μ, and (2) typical

Septoria-like, elongated, curvilinear, non-septate spores, 40 to 60 by 2 to 3·5 μ, are stages in the one fungus, other cases of *Septoria* and *Stagonospora* passing through an *Ascochyta* stage being cited.

In a discussion of the genus *Fusidomus*, the author calls attention to the pycnidial stages of *Gibberella*, in one of which, *Stagonostroma* Died., hyaline, fusoid, pluriseptate pycnospores resembling *Fusarium* conidia are borne in conceptacles arranged either singly on the host or in botryose aggregations on a stroma. According to von Höhnel (*Hedwigia*, lx, p. 157, 1919), two other pycnidial stages, *Cyanophomella* and *Cyanochyta*, belong to *Gibberella*.

MEHRLICH (F. P.). **Physiologic specialization in Phytophthora species.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1149–1150, 1934.

Of a number of species of *Phytophthora* from various sources inoculated into pineapple plants [(?) in Hawaii] with a view to determining the relationships between those responsible for heart rot and allied pathogens of other economic crops, virulent infection was caused by one culture of *P. cinnamomi* from cinnamon, one of the same species from pineapple in Australia, and seven from the same host in Hawaii; one each of *P. palmivora* (*P. meadii*) [*R.A.M.*, vii, p. 602; xiv, p. 123] from *Hevea* rubber and pineapple, one of the same fungus (cacao group) [ibid., viii, p. 526] from an unknown host; one each of *P. parasitica* (*P. melongenae*) [ibid., x, p. 755] from eggplant, *Antirrhinum*, and tomato, and two of the same organism from potato.

These data are considered to support the conclusions of Ashby, Tucker [loc. cit.], and Leonian [ibid., vi, p. 189] regarding the unsuitability of pathogenicity as a basis for specific separation in *Phytophthora*. The differentiation, for instance, of *P. cambivora* from *P. cinnamomi* on the grounds of varying susceptibility in potato tubers to their attack appears to be of questionable validity.

MEHRLICH (F. P.). **Medium for growth of Pythiaceous fungi.**—*Phytopath.*, xxiv, 10, pp. 1127–1128, 1934.

The following modified formula of the maltose malt medium used by Leonian for the culture of some Sphaeropsidales [*R.A.M.*, iii, p. 544] has given very good results during the last three years at the Pineapple Experiment Station, Honolulu, Hawaii, in the study of Sideris's species of *Phytophthora*, *Nematosporangium*, and *Pythium* [isolated mainly from pineapple: ibid., x, p. 740; xiv, p. 95]: 1 gm. potassium dihydrogen phosphate, 0·5 gm. magnesium sulphate, 1 gm. bactopeptone (Difco standardized), 5 gm. Difco extract of malt, desiccated powder, 15 gm. dextrose, and 1 l. water, autoclaved at 15 lb. for 30 minutes.

MEHRLICH (F. P.). **Nonsterile soil leachate stimulating to zoosporangia production by Phytophthora sp.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1139–1140, 1934.

By growing *Phytophthora cinnamomi* or *P. parasitica* [*R.A.M.*, xii, p. 303] in a maltose-malt extract broth, followed by rinsing in sterile distilled water and incubation in a non-sterile percolate of field soil, zoosporangia were found to be more consistently and abundantly produced than by other published methods. The zoosporangia of *P. cinna-*

momi formed under these conditions are papillate in contrast to the blunt, non-papillate organs described by other workers.

BARRETT (J. T.). **A Chytridiaceous parasite of Phytophthora.**—Abs. in *Phytopath.*, xxiv, 10, p. 1138, 1934.

A species of *Pleolpidium* was detected in a *Phytophthora* isolated from greenhouse soil [in California] occupied by snapdragon [*Antirrhinum majus*] plants affected by crown rot due to *P. cactorum* [*R.A.M.*, xiii, p. 581]. The parasite infects both the hyphae and sporangia of the *Phytophthora*, causing swellings in the former but no obvious change in the latter until the swarm spore stage is reached. Inoculation tests gave positive results.

NAGEL (C. M.). **Conidial production in species of Cercospora in pure culture.**—*Phytopath.*, xxiv, 10, pp. 1101–1110, 1 fig., 1934.

Studies were made at the Iowa Agricultural Experiment Station of potato-dextrose agar cultures of *Cercospora althaeina*, *C. avicularis*, *C. cruenta* from cowpea [*R.A.M.*, xii, p. 725; xiii, p. 11], *C. davisii* [*C. zebrina*] from *Melilotus alba* [ibid., xii, p. 269], *C. dubia* from *Chenopodium album*, *Cercospora muhlenbergiae*, *C. moricola* [ibid., xi, p. 475], *C. mirabilis*, *C. medicaginis* [*C. zebrina*], *C. physalidis* from *Physalis* sp., and *C. setariae* from *Setaria glauca*, and of *C. beticola* [ibid., xi, pp. 277, 498] on sugar beet leaf agar. Transfers from sporulating cultures yielded spores in profusion, whereas those from mycelium produced largely sterile hyphae. With the adoption of definite transfer intervals ranging from four to six days, conidia-producing cultures were maintained for periods varying from five weeks to three months.

HANSEN (H. N.) & SMITH (R. E.). **Interspecific anastomosis and the origin of new types in imperfect fungi.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1144–1145, 1934.

Anastomosis was observed to take place between *Botrytis allii* [*R.A.M.*, xiv, p. 49] and *B. ricini* grown together in culture. Of 20 monospore isolations from such an anastomosing mixed culture, 6 were identical with one parent, 9 resembled the other, and 5 were markedly different from either. Repeated isolations from the aberrant cultures led to the segregation of three types for which new varietal or even specific rank appeared to be warranted. These types have remained constant through three series of monospore cultures. It is suggested that aberrant forms from combined, interspecific cultures of imperfect fungi may arise from genotypic changes induced by the presence of specifically different nuclei in the same cell introduced by anastomosis.

CURZI (M.). **Complexité spécifique de la 'Dematophora glomerata' Viala.** [The specific complexity of *Dematophora glomerata* Viala.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 9, pp. 321–325, 1934.

In this paper the author adduces reasons in support of his view, based partly on the relationship he established between the genera *Scopulariopsis*, *Stysanus*, and *Microascus* [*R.A.M.*, xi, p. 6], that the

mycelial, pycnidial, sclerotial, and stilbaceous forms assigned by Viala to *Dematophora glomerata* belong to three distinct species of fungi. No evidence has been brought forward to confirm the opinion expressed by Viala in 1891 that '*D. glomerata*' causes serious and widespread damage to vines; for three years the author examined all types of vine foot rot from various parts of Italy, but only material from one vineyard on light soil near Rome gave rise to all four forms in culture. In this case the pycnidia were ostiolate, hairy, and lined with very short sporophores containing ovoid, hyaline spores, 2·75 to 3·25 by 1·5 to 2 μ. The pycnidial form resembles a *Lasiophoma*, but by reason of the ostiole (which Viala overlooked) is allied to *Chaetasbolisia erysiphoides* (Griff. et Maubl.) Speg. which has, however, silky pycnidia and occurs on holm oak [*Quercus ilex*]. The author names the pycnidial form [but without a diagnosis] *Vialaella glomerata* n. gen., n.sp. (= *Dematophora glomerata* p.p.). The sclerotial form is an immature *Microascus*, and the conidial form belongs to a strain of *Stysanus stemonites* [ibid., xi, p. 612], from which in culture it has no essential difference, though in nature it appears to be smaller.

Smith (C. O.). **Inoculations showing the wide host range of Botryosphaeria ribis.**—*Journ. Agric. Res.*, xlix, 5 pp. 467–476, 3 pl., 1934.

After a brief reference to the history of *Botryosphaeria ribis* and to previous studies of its host range [*R.A.M.*, xii, p. 633; xiii, p. 249], the author gives a tabulated account of his pathogenicity tests of conidial (*Dothiorella*) strains of *B. ribis chromogena* isolated from walnut (*Juglans regia*), avocado (*Persea americana*) [*P. gratissima*], lemon (*Citrus limonia*), and *Cocos plumosa*, on over fifty species of plants distributed among thirty-nine genera and twenty families. The results indicated that these strains are identical and that under the conditions of the experiments, the mycelium was able to invade the bark and woody tissues of a number of species of economic importance, suggesting that at least some of the many allied species of *Botryosphaeria* and *Dothiorella* which have been previously described chiefly on the ground of their host relationships should be regarded as identical.

While, in almost all the inoculations, healthy host tissue was invaded, certain of the species of host plants were apparently more resistant to infection than others, and it is believed that under natural conditions such hosts are rarely, if ever, infected, because of insufficiency of inoculum to break down their initial resistance.

Barrett (J. T.). **Observations on the basidial stage of Sclerotium rolfsii.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1137–1138, 1934.

Two cultures of *Sclerotium rolfsii* originating in the United States have recently produced the perfect stage [*R.A.M.*, xiii, p. 273; xiv, p. 125], which has been compared with a culture of *Corticium rolfsii* (Sacc.) Curzi [ibid., xi, p. 748] and with a basidium-forming strain of *S. rolfsii* from New Zealand. The vegetative and sclerotial characters of the American cultures were compared with one of *C. centrifugum* (Sev.) Bres. from Italy. From these comparisons it appears probable that the two American cultures and the New Zealand strain should be referred to *C. rolfsii*.

BEALE (HELEN P.). **The serum reactions as an aid in the study of filterable viruses of plants.**—*Contrib. Boyce Thompson Inst.*, vi, 3, pp. 407–435, 1 graph, 1934.

After a brief review of the literature dealing with the serological study of viruses in plants [*R.A.M.*, xii, p. 398, and above, p. 185], the author gives full details of experiments, the results of which indicated that the precipitin reaction may be a useful qualitative test in the detection of masked virus carriers, in the identification of new hosts, and also in the classification of plant viruses. Extracts from *Solanum melongena*, *S. sisymbrifolium*, *Physalis peruviana*, *Capsicum minimum* and *C. frutescens* [*C. annuum*] affected with Johnson's tobacco mosaic virus No. 1, and of Turkish tobacco affected with aucuba mosaic and attenuated tobacco mosaic [ibid., xiv, p. 61], gave a positive precipitin reaction with antiserum to tobacco virus No. 1, while extracts from other Solanaceous plants affected with mosaic diseases other than the tobacco mosaic reacted negatively with the anti-serum. A detailed description is also given of a method devised for determining the antigenic content of saline extracts of tobacco virus No. 1 to which phenol has been added, and also of certain modifications to Holmes's local lesion method [cf. ibid., xii, p. 526] for the estimation of the active virus concentration in these extracts.

It was further shown that differences of the order of 50 per cent. in the concentration of virus in tobacco mosaic No. 1 extracts may be demonstrated by inoculation of no more than sixteen *Nicotiana glutinosa* plants, but by increasing the number of inoculated plants it ought to be possible to demonstrate differences as small as 25 per cent. A quantitative relation was found to exist between the antigenic content and the active virus concentration of the extracts used in the tests. So far no evidence has been obtained that the specific antigenic substance in tobacco mosaic No. 1 may not be the virus itself.

YOUDEN (W. J.) & BEALE (HELEN P.). **A statistical study of the local lesion method for estimating Tobacco mosaic virus.**—*Contrib. Boyce Thompson Inst.*, vi, 3, pp. 437–454, 2 graphs, 1934.

This is a detailed account of the modification made by the senior author in Holmes's local lesion method [see preceding abstract] for the estimation of the concentration of the tobacco mosaic virus. By submitting a large amount of experimental data to statistical reduction, employing the analysis of variance, he obtained an accurate estimation of the degree of variability in reaction of the different plants tested, and demonstrated the existence of a gradient of susceptibility between the leaves at the different positions on the plants. In illustrating this method by some concrete examples it is shown that by using it the experimental error of the lesion count obtained from a single inoculated leaf is reduced to approximately one-third of the error reported in the original description of the method, thus trebling the accuracy of the results obtained with a given number of test plants. A further improvement consists in an experimental arrangement permitting of comparing a number of virus preparations without unnecessary duplication of a reference standard; this is attained by so distributing the inoculations

with the different preparations tested that each appears equally often on every plant and at all leaf positions.

HOLMES (F. O.). **Increases of Tobacco-mosaic virus in the absence of chlorophyll and light.**—*Phytopath.*, xxiv, 10, pp. 1125–1126, 1934.

The white, apparently chlorophyll-free areas of variegated *Capsicum frutescens* [*C. annuum*] leaves were found to respond to inoculation with the tobacco mosaic virus [see preceding abstracts] by the production of necrotic local lesions similar to those developing on normal green foliage [*R.A.M.*, xiv, p. 126], a fact suggesting that the multiplication of the virus is not dependent on the presence of chlorophyll. This conclusion is supported by the results of controlled experiments in which the undiluted juice of etiolated pieces of Green Mountain potato stems inoculated with the tobacco mosaic virus after cutting and then kept in total darkness was extracted periodically and used for inoculations on *Nicotiana glutinosa*. The average numbers of necrotic lesions from two tests 1, 2, 3, 5, 7, 10, 12, 14, and 16 days after inoculation of the cut pieces were 1, 1, 12, 58, 193, 503, 408, 437, and 641, respectively, a rate of increase in virus concentration comparable to that occurring in green potato stems and leaves inoculated with the tobacco mosaic virus under ordinary lighting conditions. In another similar test, the tobacco mosaic virus increased at a practically normal rate in chlorophyll-containing tomato plants from which light was excluded. Photosynthesis, therefore, is apparently not essential to the multiplication of this virus [cf. ibid., xiv, p. 127].

UPPAL (B. N.). **The movement of Tobacco mosaic virus in leaves of Nicotiana sylvestris.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 865–873, 2 pl., 1934.

Experimental evidence was obtained by the author, working at Princeton, N.J., that when well-developed leaves of *Nicotiana sylvestris* plants were inoculated with the virus of ordinary tobacco mosaic [see preceding abstracts] it passed from the upper to the lower epidermal cells in sufficient concentration to serve as a source of infection to healthy bean leaves inoculated with the juice 36 to 40 hours later, and continued to increase in concentration, as determined by the number of lesions it produced, for some time. It travelled from the epidermis to the mesophyll below in about 4 hours. If the average thickness of an inoculated leaf of *N. sylvestris* is taken as 275 μ, the rate of spread of the virus in the leaf tissue under the experimental conditions was roughly 7 to 8 μ per hour, independently of the movements of water and food in the leaf.

UPPAL (B. N.). **The effect of dilution on the thermal death rate of Tobacco-mosaic virus.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 874–879, 1934.

When the effect of dilution on the thermal death-rate of the ordinary tobacco mosaic virus [see preceding abstracts] was determined by the local lesion method on *Nicotiana glutinosa* and a hybrid between it and *N. tabacum*, the virus was inactivated in 10 minutes at temperatures between 86° and 87°, 82° and 84°, and 77° and 78° C. at dilutions of

1 in 10, 1 in 100, and 1 in 1,000, respectively. The thermal death point was close to 70° at a dilution of 1 in 10,000.

STANLEY (W. M.). **The action of high frequency sound waves on Tobacco mosaic virus.**—*Science*, N.S., lxxx, 2076, pp. 339–340, 1934.

Following up Takahashi's and Christensen's experiments [*R.A.M.*, xiii, p. 658], the writer subjected samples of tobacco mosaic virus to supersonic radiation by a 500-watt apparatus similar to that described by E. N. Harvey (*Biol. Bull.*, lix, p. 306, 1930) at about half intensity for nine 10-minute periods interrupted by 5-minute intervals for cooling. As shown by the first-mentioned workers, the virus prepared by their method (which left over 99 per cent. of extraneous matter), as well as a purified virus diluted with nine parts of untreated healthy juice, was almost completely inactivated at atmospheric pressure by high frequency sound waves. If infectious juice is sealed under a high vacuum to prevent cavitation (expulsion of dissolved gas) there is little indication (judging by the number of lesions produced on *Nicotiana glutinosa* and *Phaseolus vulgaris*) of inactivation by these waves. Purified virus when exposed to high frequency sound radiation at atmospheric pressure gives about 60 per cent. as many lesions as the untreated control, while practically no inactivation follows the irradiation of purified virus under a high vacuum.

It would appear from these results that virus inactivation by supersonic radiation is associated with cavitation of dissolved gas and with the presence of extraneous matter in untreated juice, since high frequency sound waves of great intensity have practically no effect on purified virus under a high vacuum.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. I. Some effects of trypsin.**—*Phytopath.*, xxiv, 10, pp. 1055–1085, 1 fig., 2 graphs, 1934.

A comprehensive, fully tabulated account is given of the writer's studies on some effects of trypsin on the virus of tobacco mosaic [see preceding abstracts], the tests being carried out by determining the number of local lesions produced by the treated and control viruses on *Nicotiana glutinosa* and *Phaseolus vulgaris*. Evidence is adduced that the decrease in infectivity of the virus following the addition of trypsin (0·1 mg. trypsin nitrogen per c.c. in a 0·01 N hydrochloric acid solution) was not due to the proteolytic activity of this substance but rather to its capacity for inducing in the plants an increased resistance to the disease. The decrease in infectivity after treating with trypsin was further demonstrated on a number of other plants [a list of which is given] and was also found to hold good for several other viruses.

DUFRÉNOY (J.). **Un virus des Renonculacées transmissible au Nicotiana tabacum.** [A virus of the Ranunculaceae transmissible to *Nicotiana tabacum*.]—*Comptes rendus Soc. de Biol.*, cxvii, 30, pp. 346–348, 1 fig., 1934.

Tobacco leaves inoculated with the juice of peonies showing concentric, annular, chlorotic lesions near Bordeaux and Brive developed the typical symptoms of streak caused by the complex 'potato virus X plus

tobacco virus' [*R.A.M.*, xii, p. 333; xiii, pp. 463, 533, and above, p. 186]. Foliage inoculated with juice extracted from the green tissues of the affected peony leaves taken from the neighbourhood of the chlorotic lesions showed neither local reactions nor retardation of growth. *Petunia* plants inoculated with juice from the chlorotic areas on peony leaves contracted mosaic and their development was delayed.

HOPKINS (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. 7. Spraying in seed-beds and lands.**—*Rhodesia Agric. Journ.*, xxxi, 10, pp. 727–734, 1934.

In an experiment carried out in Rhodesia, tobacco plants grown under conditions favourable to the development of frog eye [*Cercospora nicotianae*: *R.A.M.*, xiii, p. 277] were sprayed at approximately weekly intervals from the time when the leaves were the size of a shilling until transplanting (five applications being made) with 'capex' and 'lunevale' dry Bordeaux, and bouisol [ibid., xiii, pp. 174, 745].

The Bordeaux mixture prepared from dry Bordeaux (of which 8 lb. in 50 galls. and 90 galls. water, respectively, for capex and lunevale gives a strength of 4–4–50) killed off many very small seedlings at the first application and slightly scorched the largest leaves, but the burns did not adversely affect growth or develop into serious lesions.

After the fourth application no disease could be detected in the sprayed beds, whereas the control bed was riddled with frog eye. Two days later the plants were inoculated by means of an atomizer with a mixed suspension of the bacteria of angular leaf spot [*Bacterium angulatum*: ibid., xiii, pp. 14, 274] and wildfire [*Bact. tabacum*: ibid., xiii, p. 132], the treated beds being again sprayed three days afterwards, i.e., a week before transplanting. No angular leaf spot or wildfire subsequently appeared in the plots set out with the sprayed plants, though present on those from the control beds. Bouisol, which does not appear to have been used before on tobacco, gave satisfactory results [cf. ibid., xiv, p. 84].

The paper terminates with notes on the type of equipment recommended, the preparation of home-made Bordeaux mixture, and field spraying.

Control of blue mould of Tobacco.—*Fruit World of Australia*, xxxv, 10, p. 585, 1934.

In 1934, practically the whole tobacco crop in New South Wales was destroyed by blue mould [*Peronospora tabacina*: *R.A.M.*, xiii, p. 332]. A proclamation has since been issued requiring every owner and occupier of land on which tobacco is growing on 31st May in any year to uproot and burn every tobacco plant not later than 30th June following. Experimental evidence is stated to have shown that the destruction of volunteer plants and remains from the previous crop considerably assists control.

SHERBAKOFF (C. D.). **Tobacco wilt caused by Verticillium albo-atrum.**—*Plant Disease Reporter*, xviii, 12, p. 153, 1934. [Mimeographed.]

Verticillium albo-atrum was isolated in September, 1934, from the fibro-vascular tissues of one wilted leaf on an otherwise healthy Burley

tobacco plant, this being apparently the first authenticated record of the fungus on this host [*R.A.M.*, x, p. 757].

GARDNER (M. W.) & WHIPPLE (O. C.). **Spotted wilt of Tomatoes and its transmission by thrips.**—Abs. in *Phytopath.*, xxiv, 10, p. 1136, 1934.

In the cooler coastal regions [of California] tomato spotted wilt is prevalent among nasturtiums [*Tropaeolum majus*] and has also been detected on aster [*Callistephus chinensis*], cineraria, *Datura*, petunia, dahlia, calceolaria, calla [*Zantedeschia aethiopica*], pepper [*Capsicum annuum*], and eggplant [see above, p. 129]. The virus is transmissible by rubbing to a large number of hosts [which are listed] including lupins, broad bean [*Vicia faba*], lettuce, and nettles. Thrips have transmitted infection to several of these hosts. Under warm conditions the earlier necrotic symptoms are succeeded by stunting, mottling, and leaf distortion, while in the cooler regions the necrosis may destroy the plants in the form of die-back or streak. Frequent fumigation and roguing gave commercial control in a greenhouse. Infected plant beds are an important source of field infection.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **Application of stream double refraction in the identification of streak diseases of Tomato.**—*Phytopath.*, xxiv, 10, pp. 1111–1115, 1934.

The writers' experiments [the data resulting from which are fully tabulated] at the University of California showed that juice from streaked tomato plants infected with a combination of tobacco mosaic and potato latent viruses [*R.A.M.*, xiii, p. 797, and above, p. 199] exhibits a stream double refraction indistinguishable from that manifested by tomato plants infected by tobacco mosaic virus alone [ibid., xii, p. 525]. Juice from tomato plants infected with die-back streak reacts to stream double refraction in a manner indistinguishable from that of normal individuals. This technique, therefore, may be used to differentiate plants infected with combination streak from those suffering from die-back streak [see next abstract].

SHAPOVALOV (M.). **Some host responses in graft transmissions of dieback streak of Tomatoes.**—Abs. in *Phytopath.*, xxiv, 10, p. 1149, 1934.

Mechanical transmission of the die-back form of tomato streak [prevalent on the Pacific Coast: *R.A.M.*, xiii, p. 278] was obtained with tobacco and *Nicotiana glutinosa* in addition to tomato and *Datura stramonium*. Tobacco, *N. glutinosa*, and tomato inoculated by grafting contracted severe streak necrosis. Healthy *D. stramonium* grafted on any of these developed puckering and coarse mottling of the foliage without necrosis, and the plants thus affected, grafted on healthy tobacco, *N. glutinosa*, and tomato induced typical die-back streak. Healthy *N. glauca* grafted on streaked tomato, tobacco, and *N. glutinosa* occasionally showed a sparse necrotic spotting of the older leaves without other symptoms, and the tops of such *N. glauca* plants, grafted on healthy susceptible hosts, failed to transmit the disease.

DUFRÉNOY (J.) & SHAPOVALOV (M.). **Cytological changes in the callus of the graft union in connexion with curly top in Tomatoes.**—*Phytopath.*, xxiv, 10, pp. 1116–1118, 2 figs., 1934.

The following were the principal changes observed in the callus tissues formed at the graft union between an apparently healthy and a curly top-infected tomato [*R.A.M.*, xi, p. 210; xiii, p. 278]: (1) death and gummy degeneration of many of the cells adjoining the contact surfaces of the two plants; (2) reversion to the meristematic condition of the underlying cells, and a bridging-over process by hyperplastic cells; and (3) a very abundant formation of calcium oxalate in some of the cells deeply situated in the callus.

ALEXANDER (L. J.). **Leaf mold resistance in the Tomato.**—*Ohio Agric. Exper. Stat. Bull.* 539, 26 pp., 5 figs., 1934.

A fully tabulated account is given of the results so far obtained in experiments (still in progress) under controlled conditions at the Ohio Agricultural Experiment Station on the development of a new tomato variety resistant to leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xiii, p. 685].

Five out of 180 varieties of the common tomato (*Lycopersicum esculentum*) were found to possess some degree of resistance to the disease, namely, Main Crop, Norduke, Satisfaction, Stirling Castle, and Up-to-Date, while resistance is characteristic of the so-called Red Currant tomato (*L. pimpinellifolium*), which L. H. Bailey states is a synonym of *Solanum racemigerum* [ibid., xii, p. 477]. The partial resistance of Stirling Castle and Satisfaction, the two best commercial varieties in this respect, was found to persist in some of the progeny of crosses between them and the susceptible but otherwise desirable Globe and Marhio, the character being apparently recessive in Stirling Castle and dominant in Satisfaction. However, following prolonged exposure to infection in commercial greenhouses, individual plants of both these semi-resistant varieties contracted leaf mould in a severe form, with the result that this particular line of investigation had to be discontinued.

Two off-type plants resistant to *C. fulvum* were detected among Globe crops in two commercial greenhouses. The F_1 progenies of both these plants segregated for resistance and morphological characters. After selfing the first plant (No. 50) for four generations, four of the F_4 progenies appeared to be homozygous for resistance. The F_1, F_2, and F_3 progenies of crosses between an F_1 seedling from plant 50 and Marhio and between the same seedling and Globe largely segregated for resistance. One selfed F_2 and a large number of selfed F_4 individuals were proved to be homozygous for resistance by the uniform resistance of all the selfs and back-crosses derived from them. The factor controlling resistance in these crosses has been shown to be dominant.

Hitherto no evidence is forthcoming of the existence of biologic strains of the pathogen which might complicate the work of breeding for the combination of resistance with desirable vegetative characteristics.

Anthracnose diseases of shade trees. Elm diseases. Leaf blotch of Horse Chestnut.—*New Jersey Agric. Exper. Stat. Circs.* 307, 308, 309, 6 pp., 1934.

Popular notes are given on the symptoms, mode of infection, and control in New Jersey of anthracnose of plane [*Gnomonia veneta*: *R.A.M.*, xii, p. 251], oak [*G. veneta*: ibid., vi, p. 215], maple [*Gloeosporium apocryptum*], and other shade trees; black spot [*Gnomonia ulmea*: ibid., xii, p. 251], *Cephalosporium* canker [ibid., xiii, p. 478], *Verticillium* wilt, and Dutch disease [*Ceratostomella ulmi*: see next abstract] of elms; and leaf blotch of horse chestnut [*Guignardia aesculi*: ibid., xii, p. 251].

Present status of the Dutch Elm disease.—*Plant Disease Reporter*, xviii, 13, p. 167, 1934. [Mimeographed.]

On 10th October, 1934, the total number of trees in the United States proved to have been affected by the Dutch elm disease, as determined by the growth of *Graphium* [*Ceratostomella*] *ulmi* in culture, was 7,432, of which 4,940 were situated in New Jersey [*R.A.M.*, xiv, p. 63], 2,420 in New York, 56 in Connecticut, 11 in Ohio, 4 in Indiana, and 1 in Maryland. In New York and Connecticut infected trees are being destroyed immediately upon detection, but in New Jersey the work of systematic eradication is hampered by lack of funds.

Pierce (A. S.). **Positive infection trials with Elm 'wilt' fungi.**—*Science*, N.S., lxxx, 2078, p. 385, 1934.

Positive results have been obtained in inoculation tests with three of the fungi isolated by H. A. Harris from wilted elms in Illinois, namely, *Coniothyrium* 'A' and 'B' and *Phoma* 'B' [*R.A.M.*, xii, p. 124].

Pycnidia of *C.* 'A' developed in the exposed xylem of the four three-year-old elm seedlings inoculated with this fungus and the inoculated lateral branch of one seedling showed a gradual but definite wilt, which killed the branch in about four months from inoculation. The causal organism was recovered from the diseased tissues down to 20 cm. below the point of inoculation. Similar results were obtained with *C.* 'B', which caused generalized infection on one of the two seedlings inoculated. The fungus was recovered from points up to 15 cm. above and 12 cm. below the site of inoculation.

Drops of a spore suspension of *P.* 'B', placed on living, detached elm leaves suspended in a Petri dish with the open end of the petiole immersed in water [cf. ibid., iv, p. 375], produced rapid infection, pycnidia being formed in the mesophyll within five days.

Esmarch (F.). **Blatt- und Fruchtkrankheiten der Walnuss.** [Leaf and fruit diseases of the Walnut.]—*Die Kranke Pflanze*, xi, 10, pp. 117–119, 1 col. pl., 1934.

In connexion with official propaganda for the extension of walnut cultivation in Germany, where not more than 15 per cent. (at the outside) of the national requirements are met by the present stand of 1,500,000 trees, popular notes are given on some of the diseases affecting the crop. These include the leaf and fruit spots due to *Gnomonia*

leptostyla [*R.A.M.*, xi, p. 79], *Ascochyta juglandis* [ibid., ix, p. 419], *Microstroma juglandis* [ibid., iii, p. 260; ix, p. 275], and *Gloeosporium epicarpii*, and bacterial blight (*Pseudomonas* [*Bacterium*] *juglandis*) [ibid., xiii, p. 551]. The last-named has already been reported from Holland, Switzerland, the United States, South Australia, and New Zealand, so that its introduction into Germany is presumably only a matter of time. According to Eriksson the Erhardt variety is resistant to bacterial blight.

Miller (P. W.). **Observations on Filbert diseases in Washington and Oregon.**—*Plant Disease Reporter*, xviii, 12, pp. 155–156, 1934. [Mimeographed.]

Bacterial blight [*Bacterium juglandis*: see preceding abstract] was observed during the first week of September, 1934, in a number of Washington filbert [*Corylus avellana*] orchards [*R.A.M.*, xiii, p. 811], the Du Chilly variety being particularly severely attacked in Lewis County. In older (five to ten years) trees the upper buds and young twigs were killed, whereas in young ones the trunk tissues are commonly destroyed. The disease occurred principally on trees enfeebled by adverse environmental conditions. The Turkish filbert (*C. colurna*) was also found to be infected by bacterial blight, the organism being mostly confined to the current season's growth though a few small cankers were also found on one-year-old branches. *C. colurna*, in view of the resistance of its older growth to bacterial blight, gives some promise of utility as a root-stock for the susceptible Barcelona variety.

In Oregon the native wild hazel (*C. californica*) [*C. rostrata* Ait.] was found at the same time to be attacked on the under side of the leaves by mildew (*Phyllactinia corylea*) [ibid., xiii, p. 308], which was also detected on adjacent cultivated Brixnut filberts.

Venkata Rao (M. G.) & Iyengar (K. G.). **Studies in spike disease of Sandal. Methods of inoculation and variation of results under different methods.**—*Indian Forester*, lx, 10, pp. 689–701, 1934.

An account is given of the methods successfully used by the writers in the transmission of sandal spike disease [*R.A.M.*, xiii, p. 735] in Mysore. Twig grafting proved to be the most satisfactory, giving 100 per cent. successful transmission when union resulted, as against 63 per cent. from budding, 18 per cent. from patch bark grafts, and 17 per cent. from the insertion of a spiked leaf between the bark and wood. Infection only resulted when organic union was secured. The negative results obtained in a number of budding experiments even when union occurred cannot be attributed to inherent immunity on the part of the plants, to which spike can usually be communicated by reinoculation, but may be due either to the unequal distribution of the virus in different parts of an infected twig and its probable absence from some, or to individual variations in the minimum amount of virus required for successful transmission. Both for twig grafts and buds the average incubation period of the disease is three to four months, the highest incidence of infection being obtained from inoculations made in June and the lowest from those in October. Successful transmission of spike through the haustoria was effected in several cases of three- to five-year-

old plants that had attained a height of 5 to 8 ft., the failure of this mode of communication in younger saplings being ascribed to the incapacity of their haustoria to attack any but the small, tender roots of other sandal plants, which in cases of spike disease are all dead.

HOTSON (J. W.) & STUNTZ (D. E.). **Canker on Chamaecyparis lawsoniana.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1145–1146, 1934.

Heavy losses are stated to be caused among nursery plantings of *Chamaecyparis lawsoniana* in the Seattle district [Washington State] by a stem canker usually occurring just above soil level on the root collar and apparently resulting from wound infections. A species of (?)*Monochaetia* [cf. *R.A.M.*, xii, p. 332] has been isolated from diseased material and inoculated into a number of *C. lawsoniana* seedlings with positive results and recovery of the pathogen.

WRIGHT (E.). **Survival of heart rots in down timber in California.**—*Journ. of Forestry*, xxxii, 7, pp. 752–753, 1934.

The dry summer climate of the Sierra Nevada mountains, California, is not generally conducive to the survival of heart rots in felled timber, but a few instances are cited as evidence that certain fungi persist in a viable state longer than is generally supposed. Thus, the chalky quinine fungus (*Fomes laricis*) [*R.A.M.*, xi, p. 614] was observed on *Pinus ponderosa*, the Indian paint fungus (*Echinodontium tinctorium*) [ibid., xiii, p. 815] on *Abies concolor*, and the incense cedar dry rot fungus (*Polyporus amarus*) [ibid., xiii, p. 200] on *Libocedrus decurrens* under conditions which showed that they had remained viable for many years. In each case the fungus was found near streams or swamps, and some suggestions are made for the rapid drying of felled timber to check the progress of the heart rotting organisms.

VAUGHAN (J. A.). **Creosote plus phosphatide for the production of non-bleeding creosoted Southern Pine poles.**—*Proc. Thirtieth Ann. Meeting Amer. Wood Preservers' Assoc., 1934*, pp. 188–201, 2 figs., 3 graphs, 1934.

The addition of 0·5 to 2 per cent. of phosphatide (lecithin) to commercial creosote has been found to change the viscosity and surface tension of the oil, and to reduce the interfacial tension between the oil and any water with which it may come into contact. The sapwood of the southern pine [*Pinus palustris*] poles on which the writer's experiments were carried out was readily penetrated by the mixture, which has the further advantages of uniform distribution and elimination of any tendency to 'bleeding' or exudation of liquid creosote.

The poles are first steamed at 259° F. for a sufficient time to produce a temperature of 212° at a depth of 2½ in., after which a vacuum equivalent to 24 in. of mercury is maintained for two to three hours. The creosote-phosphatide mixture is then applied by a modified Rueping treatment [*R.A.M.*, xii, pp. 70, 670] into which an air bucking period is introduced to aid distribution and lower the surface concentration of the creosote. This is followed by a second vacuum, completing the first stage of the treatment.

The second stage consists of a Bethell treatment in which water is

introduced into the timber under vacuum to produce a lower humidity and creosote concentration gradient in the poles, thereby retarding moisture losses and minimizing cracking. This method is stated to have given consistently satisfactory results, the surfaces of the treated poles being clean, smooth, and of a pleasing shade of brown.

A discussion (pp. 201–205) followed this paper.

KINBERG (W.). **Die Konservierung des Fichten- und Tannenholzes.** [The preservation of Spruce and Fir wood.]—*Chem. Zeit.*, lviii, 83, pp. 839–841, 2 figs., 1 diag., 1934.

Technical details are given of the writer's improved method of timber impregnation by a combination of injection and kyanization [*R.A.M.*, xiii, p. 667], known as the 'Impf'- or 'Injecto-kyanverfahren', which is stated to be particularly suited for the treatment of spruce and fir poles.

WELLMAN (F. L.). **Occurrence of Cabbage yellows in Cuba.**—*Plant Disease Reporter*, xviii, 11, p. 134, 1934. [Mimeographed.]

A few cabbage plants in Havana Province, Cuba, were found in April, 1934, to be affected by yellows (*Fusarium conglutinans*) [*R.A.M.*, xiii, p. 557], which was stated to have caused considerable damage in the previous year. In a severe form the disease appears to be confined to sandy, dark-coloured soils.

LARSON (R. H.). **Wound infection and tissue invasion by Plasmodiophora brassicae.**—*Journ. Agric. Res.*, xlix, 7, pp. 607–624, 8 figs., 1934.

This is a detailed report of the author's studies at Madison, Wisconsin, of infection of cabbage and other related crucifers by *Plasmodiophora brassicae* and of the reaction of the host tissues to the organism [cf. *R.A.M.*, xiii, p. 140]. In cabbage plants wounded either by the removal of the leaf petioles or by needle punctures and planted in infected soil, spindle-shaped tumours developed only on the hypocotyl (which has a root-like structure) and root, while the tumours which developed in the wounded area of the upper stem were distinctly spheroid galls; a somewhat intermediate type (a spindle with a gall at its thickest portion) was produced on the first internode of the stem. The experiments also gave conclusive evidence that infection of the hypocotyl and stem can only occur through wounds or through ruptures in the cortex caused by the development of adventitious roots. The formation of spindle-shaped tumours in the hypocotyl and root was shown to be caused largely by the abnormal proliferation of the invaded cambium; the plasmodia migrate into the undifferentiated cells on either side of the cambium, but the greatest hyperplasia occurs in the cambial cells and phloem initials. In the upper stem nodes, the hypertrophy is chiefly in the cortical tissues, owing to the abnormal multiplication of the diseased collenchyma and cortical cells; the secondary phloem is also considerably involved.

In semi-round and globe varieties of radish and turnip, infection only occurred in the unenlarged tap-roots, while in the long (icicle) varieties, infection and hypertrophy were confined to the lower portion of the storage organ in the area of secondary roots. Infection of the hypocotyl

of the radish was readily obtained by wounding the tissues in infected soil; all the varieties of radish tested were susceptible.

TOMPKINS (C. M.). **A destructive virus disease of Cauliflower and other crucifers.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1136–1137, 1934.

Commercial cauliflower plantings throughout the coastal areas of central California are stated to be widely and severely affected by a virus disease causing 20 to 30 per cent. loss in the field. Severely infected plants were found to be stunted, the dwarfed terminal heads being surrounded by small, distorted leaves showing conspicuous chlorosis (generally confined to the intercostal areas), coarse mottling, and necrotic spotting. The cauliflower virus, which belongs definitely to the low temperature group [cf. *R.A.M.*, x, p. 411; xii, p. 108], is readily transmissible by juice inoculations to the leaves of healthy seedlings, the incubation period under greenhouse conditions (55° to 65° F.) ranging from 12 to 20 days. The disease has been transmitted to cabbage, kale, and annual stock (*Matthiola incana*) [see above, p. 172]. It was also found in commercial kale seed-beds, which may serve as the primary sources of cauliflower infection. Partial control may be effected by the roguing of diseased seedlings before transplanting.

DUNDAS (B.). **Growing powdery mildew on detached Bean leaflets and breeding for resistance.**—Abs. in *Phytopath.*, xxiv, 10, p. 1137, 1934.

For use in inoculation tests, the powdery mildew (*Erysiphe polygoni*) of beans (*Phaseolus vulgaris*) [*R.A.M.*, xii, pp. 2, 495, 673] was continuously propagated on detached leaflets supported on a 10 per cent. sucrose solution in Petri dishes kept in the light at 19° to 21° C. [cf. ibid., xiii, p. 773]. By this method a ratio of 3 resistant to 1 susceptible was obtained in the F_2 progeny of hybrids between resistant (Pinto) and susceptible (Robust) varieties, indicating that resistance to *E. polygoni* in this material is governed by a simple dominant Mendelian factor.

KENDRICK (J. B.). **Seed transmission of Fusarium yellows of Beans.**—Abs. in *Phytopath.*, xxiv, 10, p. 1139, 1934.

The vascular *Fusarium* disease of field beans (*Phaseolus vulgaris*) observed by Harter in the Sacramento Valley, California, in 1929 [*R.A.M.*, viii, p. 349] was shown by the writer's experiments in 1933 with seed grown in steam-sterilized soil to be seed-borne. Semesan at the rate of 2, 4, or 8 oz. and ceresan at 4 oz. per 100 lb. of beans practically prevented this seed-borne infection.

LECLERG (E. L.). **Parasitism of Rhizoctonia solani on Sugar Beet.**—*Journ. Agric. Res.*, xlix, 5, pp. 407–431, 3 figs., 3 graphs, 1934.

The results of the physiological and pathogenicity studies reported in this paper showed that the 78 isolates tested (51 from sugar beet and 27 from potato) of *Rhizoctonia* [*Corticium*] *solani* from various parts of North America differed widely in their rate of growth. The optimum

temperature was between 25° and 30° C. for 4 of the sugar beet isolates and between 20° and 25° for the single isolate from potato which was tested; no growth occurred at 40°, and low temperature (1°) appeared to inhibit the growth of some isolates without causing permanent injury. All the 5 isolates tested grew over a wide range of hydrogen-ion concentration, with an optimum of about P_H 5·6 for one of the sugar beet isolates and P_H 6·2 for the 4 others. In a special series of tests it was shown that the root rot induced in beets by the organism is most active and destructive at soil temperatures between 25° and 33°, and that sugar beets are susceptible to *C. solani* at all stages of growth after germination. The isolates varied widely in their capacity to rot sugar beet slices.

The fact that both in the greenhouse and in the field the sugar beet isolates were conclusively shown to be pathogenic to large sugar beet roots, while the forms from potato were not, is considered to indicate that root rot of sugar beet is probably caused by strains of *C. solani* distinct pathogenically from those that attack potato [cf. *R.A.M.*, xii, p. 133]. The isolates from sugar beet also caused a considerably higher percentage of damping-off of sugar and table beet seedlings than those from potato, but both groups of isolates were about equally destructive to lucerne seedlings. Tests with one sugar beet and two potato isolates showed that the order of virulence of these forms to sugar beet seedlings remained the same with seedlings of certain additional hosts but varied with others, and that all three caused varying degrees of stunting in seedlings of a number of hosts.

MACKIE (W. W.). **Breeding for resistance in Blackeye Cowpeas to Fusarium wilt, charcoal rot, and nematode root knot.**—Abs. in *Phytopath.*, xxiv, 10, p. 1135, 1934.

Blackeye cowpeas in the sandy soils of the interior Californian valleys are liable to severe damage from wilt (*Fusarium tracheiphilum*) [*R.A.M.*, xi, p. 220], charcoal rot (*Rhizoctonia bataticola*) [*Macrophomina phaseoli*: ibid., xi, p. 711], and nematode root knot (*Heterodera marioni*). In the F_1 progeny of crosses between Iron and Blackeye, resistance to all three diseases was dominant, this character being apparently correlated with a dark colour of the leaves. Suberin is known to occur in large quantities in the Iron parent, and its presence is thought to account for the resistance to disease shown by the progeny. Normal methods of segregation and back-crossing to the Blackeye parent have both yielded satisfactory Blackeye types.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Revision of Sugarcane Quarantine No. 15 (foreign).—2 pp., 1934. [Mimeographed.]

The present amendment (1st October, 1934) of Sugar-Cane Quarantine No. 15 of 6th June, 1914, extends the exclusion of all living cane plants or cuttings from foreign countries, except where imported by or under permit from the United States Department of Agriculture, to Porto Rico and Hawaii, and further includes bagasse [the fibrous refuse from sugar-cane mills] under the parts of sugar-cane the importation of which is prohibited.